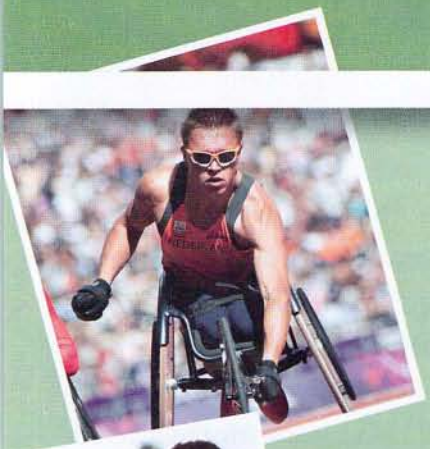
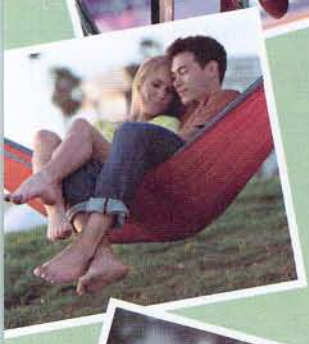
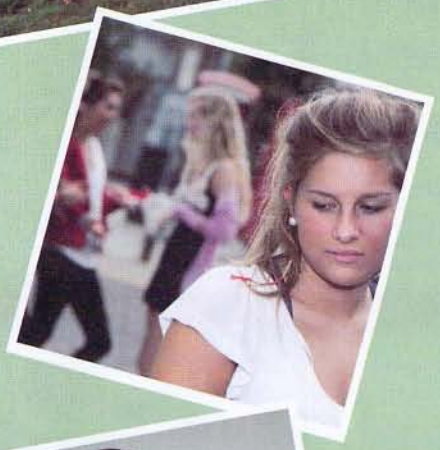
Unit VIII







Lucas Oleniuk/Toronto Star via Getty Images

Motivation, Emotion, and Stress

Modules

37 Motivational Concepts

38 Hunger Motivation

39 Sexual Motivation

40 Social Motivation: Affiliation Needs

41 Theories and Physiology of Emotion

42 Expressed Emotion

43 Stress and Health

44 Stress and Illness

After an ill-fated Saturday morning in the spring of 2003, experienced mountaineer Aron Ralston understood how motivation can energize and direct behavior. Having bagged nearly all of Colorado's tallest peaks, Ralston ventured some solo canyon hiking that seemed so risk-free he didn't bother to tell anyone where he was going. In Utah's narrow Bluejohn Canyon, just 150 yards above his final rappel, he was climbing over an 800-pound rock when disaster struck: It shifted and pinned his right wrist and arm. He was, as the title of his book says, caught *Between a Rock and a Hard Place.*

Realizing no one would be rescuing him, Ralston tried with all his might to dislodge the rock. Then, with a dull pocketknife, he tried chipping away at it. When that, too, failed, he rigged up ropes to lift the rock. Alas, nothing worked. Hour after hour, then cold night after cold night, he was stuck.

By Tuesday, he had run out of food and water. On Wednesday, as thirst and hunger gnawed, he began saving and sipping his own urine. Using his video recorder, he said good-bye to family and friends, for whom he now felt intense love: "So

again love to everyone. Bring love and peace and happiness and beautiful lives into the world in my honor. Thank you. Love you."

On Thursday, surprised to find himself still alive, Ralston had a seemingly divine insight into his reproductive future, a vision of a preschool boy being scooped up by a one-armed man. With this inspiration, he summoned his remaining strength and his enormous will to live and, over the next hour, willfully broke his arm bones and then proceeded to use that dull knife to cut off his arm. He put on a tourniquet, chopped the last piece of skin, and, after 127 hours, broke free. He then rappelled with his bleeding half-arm down a 65-foot cliff and hiked 5 miles before finding someone. He was, in his own words, "just reeling with this euphoria . . . having been dead and standing in my grave, leaving my last will and testament, etching 'Rest in peace' on the wall, all of that, gone and then replaced with having my life again. It was undoubtedly the sweetest moment that I will ever experience" (Ralston, 2004). Ralston's thirst and hunger, his sense of belonging to others, and his brute will to live and become a father highlight *motivation's* energizing and directing power.

His intense emotional experiences of love and joy demonstrate the close ties between our feelings, or *emotions,* and our motivated behaviors. In this unit, we explore our motivations and emotions, and the health effects of intense or prolonged emotions such as anger and stress.

AP® Exam Tip

The introduction to Module 37 is important, because it informs you how the whole module is organized. Read it carefully now and perhaps return to it as a review when you are through with the module.

Module 37


Helene Wiesenhaan/Getty Images

Motivational Concepts

Module Learning Objective

37-1 Define *motivation* as psychologists use the term, and identify the perspectives useful for studying motivated behavior.

"What do you think . . . should we get started on that motivation research or not?"

37-1 How do psychologists define *motivation?* From what perspectives do they view motivated behavior?

Our **motivations** arise from the interplay between nature (the bodily "push") and nurture (the "pulls" from our thought processes and culture). Consider four perspectives for viewing motivated behaviors. *Instinct theory* (now replaced by the *evolutionary perspective*) focuses on genetically predisposed behaviors. *Drive-reduction theory* focuses on how our inner pushes and external pulls interact. *Arousal theory* focuses on finding the right level of stimulation. And Abraham Maslow's *hierarchy of needs* describes how some of our needs take priority over others.

Instincts and Evolutionary Psychology

Early in the twentieth century, as the influence of Charles Darwin's evolutionary theory grew, it became fashionable to classify all sorts of behaviors as instincts. If people criticized themselves, it was because of their "self-abasement instinct." If they boasted, it reflected their "self-assertion instinct." After scanning 500 books, one sociologist compiled a list of 5759 supposed human instincts! Before long, this fad for naming instincts collapsed under its own weight. Rather than *explaining* human behaviors, the early instinct theorists were simply *naming* them. It was like "explaining" a bright child's low grades by labeling the child an "underachiever." To name a behavior is *not* to explain it.

To qualify as an **instinct,** a complex behavior must have a fixed pattern throughout a species and be unlearned (Tinbergen, 1951). Such behaviors are common in other species (Module 26 described salmon returning to their birthplace, and Module 48 will describe imprinting in birds). Human behavior, too, exhibits certain unlearned fixed patterns, including infants' innate reflexes for rooting and sucking.

Although *instinct theory* failed to explain most human motives, *evolutionary psychology's* underlying assumption that genes predispose species-typical behavior remains as strong as ever. We saw this in Module 29's discussion of animals' biological predispositions to learn certain behaviors. And we will see this in later discussions of how evolution might influence our phobias, our helping behaviors, and our romantic attractions.

AP® Exam Tip

Note that this section illustrates psychology's biological perspective.

motivation a need or desire that energizes and directs behavior

instinct a complex, unlearned behavior that is rigidly patterned throughout a species.

Michael Ventura/Alamy

David Santiago Garcia/Science Source

Same motive, different wiring The more complex the nervous system, the more adaptable the organism. Both humans and weaverbirds satisfy their need for shelter in ways that reflect their inherited capacities. Human behavior is flexible; we can learn whatever skills we need to build a house. The bird's behavior pattern is fixed; it can build only this kind of nest.

Drives and Incentives

When the original instinct theory of motivation collapsed, it was replaced by **drive-reduction theory**—the idea that a physiological need creates an aroused state that drives the organism to reduce the need by, say, eating or drinking. With few exceptions, when a physiological need increases, so does a psychological *drive*—an aroused, motivated state.

The physiological aim of drive reduction is **homeostasis**—the maintenance of a steady internal state. An example of homeostasis (literally "staying the same") is the body's temperature-regulation system, which works like a room thermostat. Both systems operate through feedback loops: Sensors feed room temperature to a control device. If the room temperature cools, the control device switches on the furnace. Likewise, if our body temperature cools, blood vessels constrict to conserve warmth, and we feel driven to put on more clothes or seek a warmer environment (**FIGURE 37.1**).

drive-reduction theory the idea that a physiological need creates an aroused tension state (a drive) that motivates an organism to satisfy the need.

homeostasis a tendency to maintain a balanced or constant internal state; the regulation of any aspect of body chemistry, such as blood glucose, around a particular level.

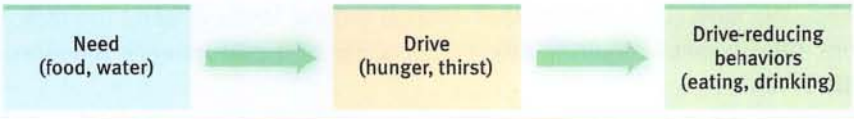


Figure 37.1

Drive-reduction theory Drive-reduction motivation arises from *homeostasis*—an organism's natural tendency to maintain a steady internal state. Thus, if we are water deprived, our thirst drives us to drink and to restore the body's normal state.

AP® Exam Tip

Read carefully! Homeostasis is *not* a motivation theory, but rather a biological principle that applies to some motivational theories (like drive-reduction).

FYI

Recall from Module 29 that we are also motivated by both *intrinsic* and *extrinsic* rewards.

Not only are we *pushed* by our need to reduce drives, we also are *pulled* by **incentives**—positive or negative stimuli that lure or repel us. This is one way our individual learning histories influence our motives. Depending on our learning, the aroma of good food, whether freshly baked pizza or freshly toasted ants, can motivate our behavior. So can the sight of those we find attractive or threatening.

When there is both a need and an incentive, we feel strongly driven. The food-deprived person who smells baking bread feels a strong hunger drive. In the presence of that drive, the baking bread becomes a compelling incentive. For each motive, we can therefore ask, "How is it pushed by our inborn physiological needs and pulled by incentives in the environment?"

Optimum Arousal

We are much more than homeostatic systems, however. *Optimal arousal theory* holds that some motivated behaviors actually *increase* arousal. Well-fed animals will leave their shelter to explore and gain information, seemingly in the absence of any need-based drive. Curiosity drives monkeys to monkey around trying to figure out how to unlock a latch that opens nothing or how to open a window that allows them to see outside their room (Butler, 1954). It drives the 9-month-old infant to investigate every accessible corner of the house. It drives you to read this text, and it drives the scientists whose work this text discusses. And it drives explorers and adventurers such as Aron Ralston and George Mallory. Asked why he wanted to climb Mount Everest, the *New York Times* reported that Mallory answered, "Because it is there." Those who, like Mallory and Ralston, enjoy high arousal are most likely to seek out intense music, novel foods, and risky behaviors (Zuckerman, 1979). They are "sensation-seekers."

Harlow Primate Laboratory, University of Wisconsin

Glenn Swier

Driven by curiosity Baby monkeys and young children are fascinated by things they've never handled before. Their drive to explore the relatively unfamiliar is one of several motives that do not fill any immediate physiological need.

So, human motivation aims not to eliminate arousal but to seek optimum levels of arousal. Having all our biological needs satisfied, we feel driven to experience stimulation and we hunger for information. We are "infovores," said neuroscientists Irving Biederman and Edward Vessel (2006), after identifying brain mechanisms that reward us for acquiring information. Lacking stimulation, we feel bored and look for a way to increase arousal to some optimum level. However, with too much stimulation comes stress, and we then look for a way to decrease arousal.

Two early-twentieth-century psychologists studied the relationship of arousal to performance and identified what we now call the **Yerkes-Dodson law,** suggesting that moderate arousal would lead to optimal performance (Yerkes & Dodson, 1908). When taking an exam, for example, it pays to be moderately aroused—alert but not trembling with nervousness. We have since learned that optimal arousal levels depend the task as well, with more difficult tasks requiring lower arousal for best performance (Hembree, 1988) (**FIGURE 37.2**).

incentive a positive or negative environmental stimulus that motivates behavior.

Yerkes-Dodson law the principle that performance increases with arousal only up to a point, beyond which performance decreases.

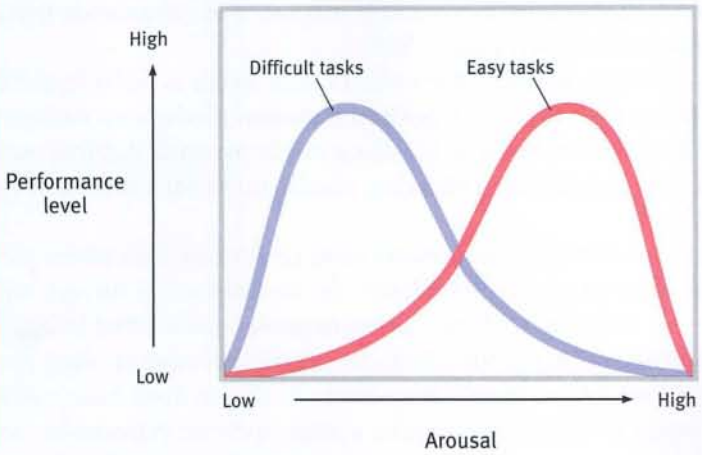


Figure 37.2
Arousal and performance

A Hierarchy of Motives

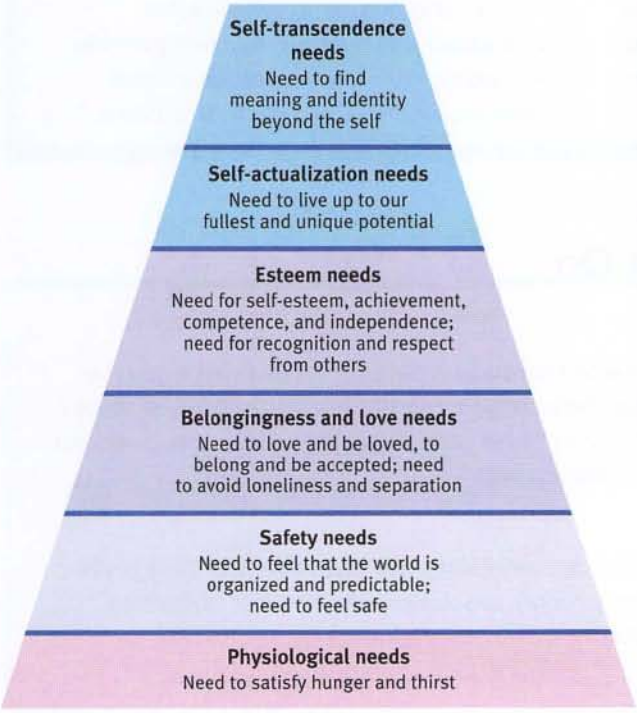
Some needs take priority over others. At this moment, with your needs for air and water hopefully satisfied, other motives—such as your desire to achieve (discussed in Module 82)—are energizing and directing your behavior. Let your need for water go unsatisfied and your thirst will preoccupy you. Just ask Aron Ralston. Deprived of air, your thirst would disappear.

Abraham Maslow (1970) described these priorities as a **hierarchy of needs** (**FIGURE 37.3**). At the base of this pyramid are our physiological needs, such as those for food and water. Only if these needs are met are we prompted to meet our need for safety, and then to satisfy our needs to give and receive love and to enjoy self-esteem. Beyond this, said Maslow (1971), lies the need to actualize one's full potential. (More on self-esteem and self-actualization in Modules 57 and 59.)

Near the end of his life, Maslow proposed that some people also reach a level of self-transcendence. At the self-actualization level, people seek to realize their own potential.

hierarchy of needs Maslow's pyramid of human needs, beginning at the base with physiological needs that must first be satisfied before higher-level safety needs and then psychological needs become active.

"Hunger is the most urgent form of poverty." -Alliance to End Hunger, 2002




AP Photo/The Oklahoman, Steve Sisney

Figure 37.3
Maslow's hierarchy of needs Once our lower-level needs are met, we are prompted to satisfy our higher-level needs. (From Maslow, 1970.) For survivors of the disastrous tornadoes that swept across the Midwest and Southeastern United States in 2011, satisfying very basic needs for water, food, and safety became top priority. Higher-level needs on Maslow's hierarchy, such as respect, self-actualization, and meaning, become far less important during such times.

At the self-transcendence level, people strive for meaning, purpose, and communion that is beyond the self, that is *transpersonal* (Koltko-Rivera, 2006).

Maslow's hierarchy is somewhat arbitrary; the order of such needs is not universally fixed. People have starved themselves to make a political statement. Today's evolutionary psychologists concur with the first four levels of Maslow's needs pyramid. But they note that gaining and retaining mates, and parenting offspring, are also universal human motives (Kenrick et al., 2010).

Nevertheless, the simple idea that some motives are more compelling than others provides a framework for thinking about motivation. Worldwide life-satisfaction surveys support this basic idea (Oishi et al., 1999; Tay & Diener, 2011). In poorer nations that lack easy access to money and the food and shelter it buys, financial satisfaction more strongly predicts feelings of well-being. In wealthy nations, where most are able to meet basic needs, home-life satisfaction is a better predictor. Self-esteem matters most in individualist nations, whose citizens tend to focus more on personal achievements than on family and community identity. (**TABLE 37.1** summarizes the strengths and weaknesses of the different perspectives on motivation.)

In the ensuing modules, we will consider four representative motives, beginning at the physiological level with hunger and working up through sexual motivation and the need to belong. At each level, we shall see how experience interacts with biology.

Table 37.1

Motivational Theory	Strength	Weakness
Instinct Theory and *Evolutionary Psychology*	Evolutionary psychology helps explain behavioral similarities due to adaptations from our ancestral past.	Instinct theory explains animal behavior better than human behavior; humans have few true instincts.
Drive-Reduction Theory	Explains our motivation to reduce arousal by meeting basic needs, such as hunger or thirst.	Does not explain why some motivated behaviors *increase* arousal.
Optimal Arousal Theory	Explains that motivated behaviors may decrease *or* increase arousal.	Does not explain our motivation to address our more complex social needs.
Maslow's Hierarchy of Needs	Incorporates the idea that we have various *levels* of needs, including lower-level physiological and safety needs, and higher-level social, self-esteem, actualization, and meaning needs.	The order of needs may change in some circumstances. Evolutionary psychologists note the absence in the hierarchy of the universal human motives to find a mate and reproduce.

Before You Move On

▶ ASK YOURSELF

Consider your own experiences in relation to Maslow's hierarchy of needs. Have you ever experienced true hunger or thirst that displaced your concern for other, higher-level needs? Do you usually feel safe? Loved? Confident? How often do you feel you are able to address what Maslow called your "self-actualization" needs?

▶ TEST YOURSELF

While on a long road trip, you suddenly feel very hungry. You see a diner that looks pretty deserted and creepy, but you are *really* hungry, so you stop anyway. What motivational perspective would most easily explain this behavior, and why?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 37 Review

37-1 How do psychologists define *motivation?* From what perspectives do they view motivated behavior?

- *Motivation* is a need or desire that energizes and directs behavior.
- The *instinct*/evolutionary perspective explores genetic influences on complex behaviors.
- *Drive-reduction theory* explores how physiological needs create aroused tension states (drives) that direct us to satisfy those needs. Environmental *incentives* can intensify drives. Drive-reduction's goal is *homeostasis,* maintaining a steady internal state.
- Optimal arousal theory proposes that some behaviors (such as those driven by curiosity) do not reduce physiological needs but rather are prompted by a search for an optimum level of arousal.
- Abraham Maslow's *hierarchy of needs* proposes a pyramid of human needs, from basic needs such as hunger and thirst up to higher-level needs such as self-actualization and self-transcendence.

Multiple-Choice Questions

1. Which of the following is an unlearned, complex behavior exhibited by all members of a species?

a. Reflex
b. Drive
c. Incentive
d. Instinct
e. Motive

2. Which of the following is an aroused motivational state created by a physiological need?

a. Drive
b. Instinct
c. Incentive
d. Reflex
e. Motive

3. Which of the following is a conclusion that can be drawn from the Yerkes-Dodson law?

a. Performance on easy tasks is best when arousal is low.
b. Performance is best when arousal is extremely high.
c. Performance is best when arousal is extremely low.
d. Performance on difficult tasks is best when arousal is high.
e. Performance is best when arousal is moderate.

4. Which of the following is the lowest priority motive in Abraham Maslow's hierarchy of needs?

a. Belongingness and love needs
b. Physiological needs
c. Esteem needs
d. Self-actualization needs
e. Self-transcendence needs

Practice FRQs

1. How can you use Maslow's hierarchy of needs to explain why a

- hungry young person would steal?
- lonely new student in a school would join a club?
- successful artist would continue to invest tremendous effort in her career?

Answer

1 point: A hungry young person would steal because of a physiological need.

1 point: A lonely new student would join a club to meet belongingness and love needs.

1 point: A successful artist would still work hard to satisfy the need for self-actualization.

2. Describe how three different motivational theories could explain a young man's desire to become an excellent soccer player.

(3 points)

Module 38

Hunger Motivation


Jim West/Photo Edit

Module Learning Objectives

38-1 Describe the physiological factors that produce hunger.

38-2 Discuss cultural and situational factors that influence hunger.

38-3 Discuss the factors that predispose some people to become and remain obese.

The power of physiological needs was vividly demonstrated when Ancel Keys and his research team (1950) conducted a now-classic study of semistarvation. They first fed 36 male volunteers (all wartime conscientious objectors) just enough to maintain their initial weight. Then, for six months, they cut this food level in half. The effects soon became visible. Without thinking about it, the men began conserving energy. They appeared sluggish and dull. After dropping rapidly, their body weights stabilized at about 25 percent below their starting point.

As Maslow might have guessed, the men became food obsessed. They talked food. They daydreamed food. They collected recipes, read cookbooks, and feasted their eyes on delectable forbidden food. Preoccupied with their unmet basic need, they lost interest in sex and social activities. As one man reported, "If we see a show, the most interesting part of it is contained in scenes where people are eating. I couldn't laugh at the funniest picture in the world, and love scenes are completely dull."

"Nature often equips life's essentials—sex, eating, nursing—with built-in gratification."
-Frans de Waal, "Morals Without God?," 2010

The semistarved men's preoccupations illustrate how activated motives can hijack our consciousness. As journalist Dorothy Dix (1861–1951) observed, "Nobody wants to kiss when they are hungry." When we're hungry, thirsty, fatigued, or sexually aroused, little else seems to matter. When we're not, food, water, sleep, or sex just don't seem like such big things in life, now or ever.

"Never hunt when you're hungry."

In studies, people in a motivational "hot" state (from fatigue, hunger, or sexual arousal) have easily recalled such feelings in their own past and have perceived them as driving forces in others' behavior (Nordgren et al., 2006, 2007). (You may recall from Module 32 a parallel effect of our current good or bad mood on our memories.) Grocery shop with an empty stomach and you are more likely to see those jelly-filled doughnuts as just what you've always loved and will be wanting tomorrow. *Motives matter mightily.*

"The full person does not understand the needs of the hungry." -IRISH PROVERB

The Physiology of Hunger

38-1 What physiological factors produce hunger?

Deprived of a normal food supply, Keys' semistarved volunteers were clearly hungry. But what precisely triggers hunger? Are the pangs of an empty stomach the source of hunger? So it seemed to A. L. Washburn. Working with Walter Cannon (Cannon & Washburn, 1912), Washburn agreed to swallow a balloon attached to a recording device (**FIGURE 38.1**). When inflated to fill his stomach, the balloon transmitted his stomach contractions. Washburn supplied information about his *feelings* of hunger by pressing a key each time he felt a hunger pang. The discovery: Washburn was indeed having stomach contractions whenever he felt hungry.

Can hunger exist without stomach pangs? To answer that question, researchers removed some rats' stomachs and created a direct path to their small intestines (Tsang, 1938). Did the rats continue to eat? Indeed they did. Some hunger persists similarly in humans whose stomachs have been removed as a treatment for ulcers or cancer. So the pangs of an empty stomach are not the *only* source of hunger. What else might trigger hunger?

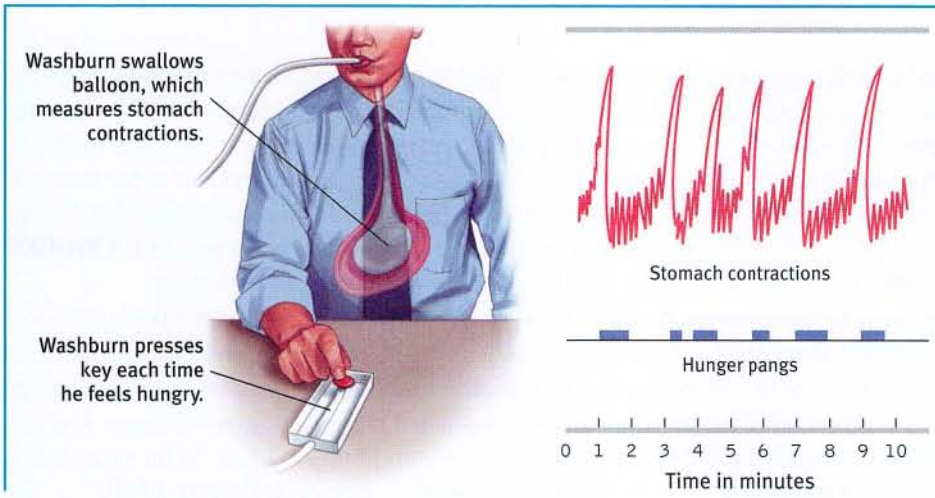


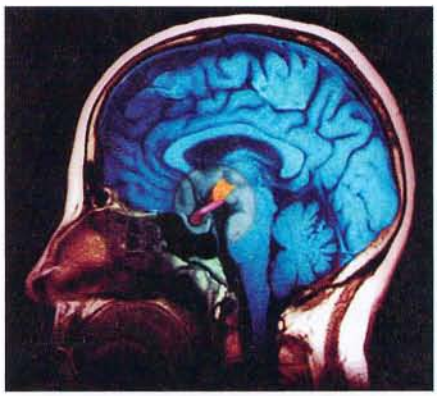
Figure 38.1
Monitoring stomach contractions
Using this procedure, Washburn showed that stomach contractions (transmitted by the stomach balloon) accompany our feelings of hunger (indicated by a key press). (From Cannon, 1929.)

Body Chemistry and the Brain

Somehow, somewhere, your body is keeping tabs on the energy it takes in and the energy it uses. If this weren't true, you would be unable to maintain a stable body weight. A major source of energy in your body is the blood sugar **glucose.** If your blood glucose level drops, you won't consciously feel this change, but your stomach, intestines, and liver will signal your brain to motivate eating. Your brain, which is automatically monitoring your blood chemistry and your body's internal state, will then trigger hunger.

glucose the form of sugar that circulates in the blood and provides the major source of energy for body tissues. When its level is low, we feel hunger.

How does the brain integrate these messages and sound the alarm? The work is done by several neural areas, some housed deep in the brain within the hypothalamus (**FIGURE 38.2**). This neural traffic intersection includes areas that influence eating. For example, one neural arc (called the *arcuate nucleus*) has a center that secretes appetite-stimulating hormones, and another center that secretes appetite-suppressing hormones. Explorations of this neural area and others reveal that when an appetite-enhancing center is stimulated electrically, well-fed animals begin to eat. If the area is destroyed, even starving animals have no interest in food. The opposite occurs when an appetite-suppressing area is stimulated: Animals will stop eating. Destroy this area and animals will eat and eat, and become extremely fat (Duggan & Booth, 1986; Hoebel & Teitelbaum, 1966) (**FIGURE 38.3**).



ISM/Phototake

Figure 38.2
The hypothalamus As we saw in Module 11, the hypothalamus (colored orange) performs various body maintenance functions, including control of hunger.

Olivier Voisin/Science Source

Figure 38.3
Evidence for the brain's control of eating The fat mouse on the left has nonfunctioning leptin receptors.

set point the point at which an individual's "weight thermostat" is supposedly set. When the body falls below this weight, an increase in hunger and a lowered metabolic rate may act to restore the lost weight.

basal metabolic rate the body's resting rate of energy expenditure.

Blood vessels supply the hypothalamus, enabling it to respond to our current blood chemistry as well as to incoming neural information about the body's state. One of its tasks is monitoring levels of appetite hormones, such as *ghrelin,* a hunger-arousing hormone secreted by an empty stomach. During bypass surgery for severe obesity, surgeons seal off part of the stomach. The remaining stomach then produces much less ghrelin, and the person's appetite lessens (Lemonick, 2002). Other appetite hormones include *insulin, leptin, orexin,* and *PYY;* **FIGURES 38.3** and **38.4** illustrate and describe how they influence your feelings of hunger.

The interaction of appetite hormones and brain activity suggests that the body has some sort of "weight thermostat." When semistarved rats fall below their normal weight, this system signals the body to restore the lost weight. The rats' hunger increases and their energy output decreases. If body weight rises—as happens when rats are force fed—hunger decreases and energy expenditure increases. In this way, rats (and humans) tend to hover around a stable weight, or **set point,** influenced in part by heredity (Keesey & Corbett, 1983).

FYI

Over the next 40 years you will eat about 20 tons of food. If, during those years, you increase your daily intake by just .01 ounce more than required for your energy needs, you will gain an estimated 24 pounds (Martin et al., 1991).

We humans (and other species, too) vary in our **basal metabolic rate,** a measure of how much energy we use to maintain basic body functions when our body is at rest. But we share a common response to decreased food intake: Our basal metabolic rate drops, as it did for participants in Keys' experiment. After 24 weeks of semistarvation, they stabilized at three-quarters of their normal weight, although they were taking in only *half* their previous calories. How did their bodies achieve this dieter's nightmare? They reduced their energy expenditure, partly by being less active, but partly by dropping their basal metabolic rate by 29 percent.

Some researchers have suggested that the idea of a biologically *fixed* set point is too rigid to explain some things. One thing it doesn't address is that slow, sustained changes in body weight can alter a person's set point (Assanand et al., 1998). Another is that when we

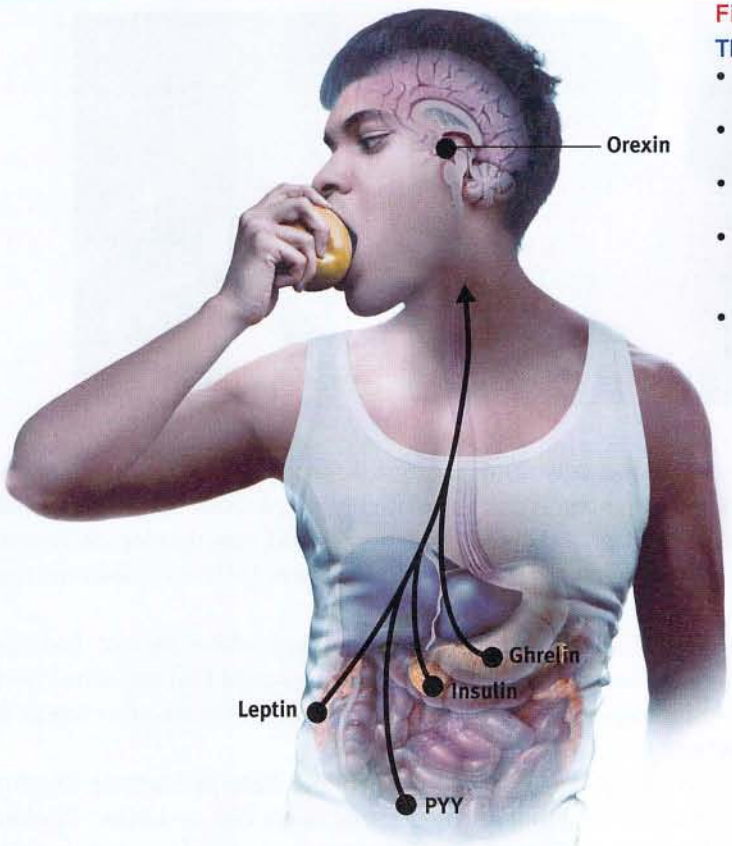
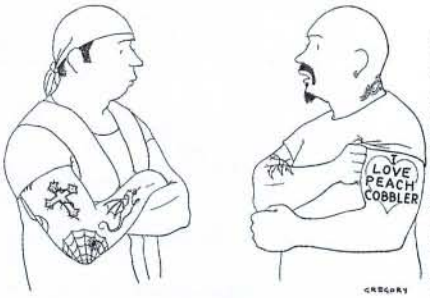


Figure 38.4

The appetite hormones

- *Insulin:* Hormone secreted by pancreas; controls blood glucose.
- *Ghrelin:* Hormone secreted by empty stomach; sends "I'm hungry" signals to the brain.
- *Orexin:* Hunger-triggering hormone secreted by hypothalamus.
- *Leptin:* Protein hormone secreted by fat cells; when abundant, causes brain to increase metabolism and decrease hunger.
- *PYY:* Digestive tract hormone; sends "I'm not hungry" signals to the brain.

have unlimited access to a wide variety of tasty foods, we tend to overeat and gain weight (Raynor & Epstein, 2001). And set points don't explain why psychological factors influence hunger. For all these reasons, some prefer the looser term *settling point* or *set range* to indicate the level at which a person's weight settles in response to caloric intake and energy use. As we will see next, these factors are influenced by environment as well as biology.



"Never get a tattoo when you're drunk and hungry."

The Psychology of Hunger

38-2 What cultural and situational factors influence hunger?

We have seen that our eagerness to eat is pushed by our body chemistry and brain activity. Yet there is more to hunger than meets the stomach. This was strikingly apparent when trickster researchers tested two patients who had no memory for events occurring more than a minute ago (Rozin et al., 1998). If offered a second lunch 20 minutes after eating a normal lunch, both patients readily consumed it . . . and usually a third meal offered 20 minutes after they finished the second. This suggests that one part of our decision to eat is our memory of the time of our last meal. As time passes, we think about eating again, and those thoughts trigger feelings of hunger.

Taste Preferences: Biology and Culture

Body chemistry and environmental factors together influence not only the when of hunger, but also the what—our taste preferences. When feeling tense or depressed, do you crave starchy, carbohydrate-laden foods? Carbohydrates such as pasta, chips, and sweets help boost levels of the neurotransmitter serotonin, which has calming effects. When stressed, even rats find it extra rewarding to scarf Oreos (Artiga et al., 2007; Boggiano et al., 2005).

RICHARD OLSENIUS/NGS Image Collection

Jeffrey Jackson/Alamy

An acquired taste People everywhere learn to enjoy the fatty, bitter, or spicy foods common in their culture. For these Alaska Natives (left), but not for most other North Americans, whale blubber is a tasty treat. For Peruvians (right), roasted guinea pig is similarly delicious.

Our preferences for sweet and salty tastes are genetic and universal, but conditioning can intensify or alter those preferences. People given highly salted foods may develop a liking for excess salt (Beauchamp, 1987). People sickened by a food may develop an aversion to it. (The frequency of children's illnesses provides many chances for them to learn to avoid certain foods.)

Our culture teaches us that some foods are acceptable but others are not. Bedouins enjoy eating the eye of a camel, which most North Americans would find repulsive. North Americans and Europeans also shun horse, dog, and rat meat, all of which are prized elsewhere.

But there is biological wisdom to many of our taste preferences. Environments can influence the human genetics that affect diet and taste. In places where agriculture has produced milk, for example, survival patterns have favored people with lactose tolerance (Arjamaa & Vuorisalo, 2010). And in hot climates (where foods spoil more quickly) recipes often include spices that inhibit the growth of bacteria (**FIGURE 38.5**). India averages nearly 10 spices per meat recipe; Finland, 2 spices. Pregnant women's food dislikes—and the nausea associated with them—peak about the tenth week, when the developing embryo is most vulnerable to toxins.

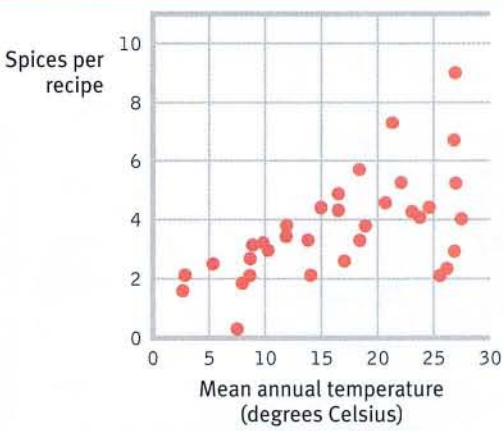


Figure 38.5
Hot cultures like hot spices

Rats tend to avoid unfamiliar foods (Sclafani, 1995). So do we, especially those that are animal based. This *neophobia* (dislike of things unfamiliar) surely was adaptive for our ancestors by protecting them from potentially toxic substances. In time, though, most people who repeatedly sample an initially novel fruit drink or ethnic food come to appreciate the new taste (Pliner, 1982, Pliner et al., 1993).

Situational Influences on Eating

To a surprising extent, situations also control our eating—a phenomenon psychologists have called the *ecology of eating*. Here are three situations you may have noticed but underestimated:

- Do you eat more when eating with others? Most of us do (Herman et al., 2003; Hetherington et al., 2006). After a party, you may realize you've overeaten. This happens because the presence of others tends to amplify our natural behavior tendencies. (You'll hear more about *social facilitation* in Module 76.)
- *Unit bias* occurs with similar mindlessness. Working with researchers at France's National Center for Scientific Research, Andrew Geier and his colleagues (2006) explored a possible explanation of why French waistlines are smaller than American waistlines. From soda drinks to yogurt sizes, the French offer foods in smaller portion sizes. Does it matter? (One could as well order two small sandwiches as one large one.) To find out, the investigators offered people varieties of free snacks. For example, in the lobby of an apartment house, they laid out either full or half pretzels, big or little Tootsie Rolls, or a big bowl of M&M's with either a small or

large serving scoop. Their consistent result: Offered a supersized standard portion, people put away more calories. In other studies (Wansink, 2006, 2007), even nutrition experts helped themselves to 31 percent more ice cream when given a big bowl rather than a small one, and 15 percent more when scooping with a big rather than a small scoop. Portion size matters.

- *Food variety* also stimulates eating. Offered a dessert buffet, we eat more than we do when asked to choose a portion from one favorite dessert. For our early ancestors, these behaviors were adaptive. When foods were abundant and varied, eating more provided a wide range of vitamins and minerals and produced fat that protected them during winter cold or famine. When a bounty of varied foods was unavailable, eating less extended the food supply until winter or famine ended (Polivy et al., 2008; Remick et al., 2009).

NBCU Photo Bank via Getty Images

Cooking shows increase appetites but not healthful home cooking Julia Child was once the only chef on TV. Today dozens of U.S. cooking shows are broadcast to millions of viewers daily. Yet fewer Americans than ever are home cooking their own, more healthful meals (Pollan, 2009). Nations that devote more time to food preparation at home tend to have lower rates of obesity (Cutler et al., 2003).

Obesity and Weight Control

38-3 What factors predispose some people to become and remain obese?

Obesity can be socially toxic, by affecting both how you are treated and how you feel about yourself. Obesity has been associated with lower psychological well-being, especially among women, and increased risk of depression (de Wit et al., 2010; Luppino et al., 2010; Mendes, 2010a). Obese 6- to 9-year-olds are 60 percent more likely to suffer bullying (Lumeng et al., 2010). And, as we will see, obesity has physical health risks as well. Yet few overweight people win the battle of the bulge. Why? And why do some people gain weight while others eat the same amount and seldom add a pound?

The Physiology of Obesity

Our bodies store fat for good reasons. Fat is an ideal form of stored energy—a high-calorie fuel reserve to carry the body through periods when food is scarce—a common occurrence in our prehistoric ancestors' world. No wonder that in many developing societies today (as in Europe in earlier centuries) people find heavier bodies attractive: Obesity signals affluence and social status (Furnham & Baguma, 1994; Swami et al., 2011).

In parts of the world where food and sweets are now abundantly available, the rule that once served our hungry distant ancestors—*When you find energy-rich fat or sugar, eat it!*—has become dysfunctional. Pretty much everywhere this book is being read, people have a growing problem. The World Health Organization (WHO) (2007) has estimated that more than 1 billion people worldwide are overweight, and 300 million of them are clinically *obese,* defined by the WHO as a *body mass index* (BMI) of 30 or more. (See www.cdc.gov/healthyweight/assessing/bmi to calculate your BMI.) In the United States, the adult obesity rate has more than doubled in the last 40 years, reaching 34 percent, and child-teen obesity has quadrupled (Flegal et al., 2010).

Significant obesity increases the risk of diabetes, high blood pressure, heart disease, gallstones, arthritis, and certain types of cancer, thus increasing health care costs and shortening life expectancy (de Gonzales et al., 2010; Jarrett et al., 2010; Sun et al., 2009). Recent research also has linked women's obesity to their risk of late-life cognitive decline, including Alzheimer's disease and brain tissue loss (Bruce-Keller et al., 2009; Whitmer et al., 2008). One experiment found improved memory performance 12 weeks after severely obese people had weight-loss surgery and lost significant weight. Those not having the surgery showed some further cognitive decline (Gunstad et al., 2011).

Research on the physiology of obesity challenges the stereotype of severely overweight people being weak-willed gluttons.

"Americans, on average, report that they weigh 177 pounds, but would like to weigh 161."
-Elizabeth Mendes, www.gallup.com, 2010

SET POINT AND METABOLISM

Once we become fat, we require less food to maintain our weight than we did to attain it. Fat has a lower metabolic rate than does muscle—it takes less food energy to maintain. When an overweight person's body drops below its previous set (or settling) point, the person's hunger increases and metabolism decreases. Thus, the body adapts to starvation by burning off fewer calories.

Lean people also seem naturally disposed to move about. They burn more calories than do energy-conserving overweight people who tend to sit still longer (Levine et al., 2005). These individual differences in resting metabolism help explain why two people of the same height, age, and activity level can maintain the same weight, even if one of them eats much less than the other does.

THE GENETIC FACTOR

Do our genes predispose us to fidget or sit still? Studies do reveal a genetic influence on body weight. Consider two examples:

- Despite shared family meals, adoptive siblings' body weights are uncorrelated with one another or with those of their adoptive parents. Rather, people's weights resemble those of their biological parents (Grilo & Pogue-Geile, 1991).
- Identical twins have closely similar weights, even when reared apart (Hjelmborg et al., 2008; Plomin et al., 1997). Across studies, their weight correlates +.74. The much lower +.32 correlation among fraternal twins suggests that genes explain two-thirds of our varying body mass (Maes et al., 1997).

THE FOOD AND ACTIVITY FACTORS

Corey Nolen/Aurora Open/Corbis

Genes tell an important part of the obesity story. But environmental factors are mighty important, too.

Studies in Europe, Japan, and the United States show that children and adults who suffer from *sleep loss* are more vulnerable to obesity (Keith et al., 2006; Nedeltcheva et al., 2010; Taheri, 2004a,b). With sleep deprivation, the levels of leptin (which reports body fat to the brain) fall, and ghrelin (the appetite-stimulating stomach hormone) rise.

Social influence is another factor. One 32-year study of 12,067 people found them most likely to become obese when a friend became obese (Christakis & Fowler, 2007). If the obese friend was a close one, the odds of likewise becoming obese almost tripled. Moreover, the correlation among friends' weights was not simply a matter of seeking out similar people as friends. Friends matter.

The strongest evidence that environment influences weight comes from *our fattening world* (**FIGURE 38.6**). What explains this growing problem? Changing *food consumption* and *activity levels* are at work. We are eating more and moving less, with lifestyles approaching those of animal feedlots (where farmers fatten inactive animals). In the United States, jobs requiring moderate physical activity declined from about 50 percent in 1960 to 20 percent in 2011 (Church et al., 2011).

"We put fast food on every corner, we put junk food in our schools, we got rid of [physical education classes], we put candy and soda at the checkout stand of every retail outlet you can think of. The results are in. It worked." -Harold Goldstein, Executive Director of the California Center for Public Health Advocacy, 2009, when imagining a vast U.S. national experiment to encourage weight gain

The "bottom" line: New stadiums, theaters, and subway cars—but not airlplanes—are widening seats to accommodate the girth growth (Hampson, 2000; Kim & Tong, 2010). Washington State Ferries abandoned a 50-year-old standard: "Eighteen-inch butts are a thing of the past" (Shepherd, 1999). New York City, facing a large problem with Big Apple bottoms, has mostly replaced 17.5-inch bucket-style subway seats with bucketless seats (Hampson, 2000). In the end, today's people need more room.

We will revisit this lesson in Unit XI's study of individual differences. There can be high levels of heritability (genetic influence on individual differences in such things as intelligence) without heredity explaining group differences. Genes mostly determine why one person today is heavier than another. Environment mostly determines why people today

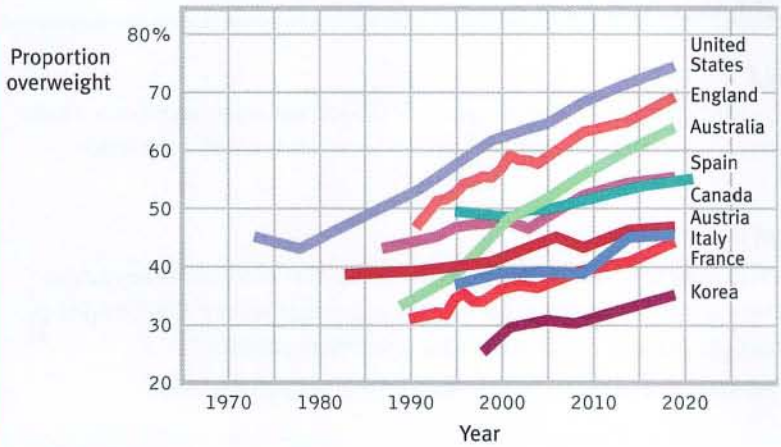


Figure 38.6
Past and projected overweight rates, by the Organization for Economic Cooperation and Development

are heavier than their counterparts 50 years ago. Our eating behavior also demonstrates the now-familiar interaction among biological, psychological, and social-cultural factors. For tips on shedding unwanted pounds, see Close-up: Waist Management.

Close-up

Waist Management

Perhaps you are shaking your head: "Slim chance I have of becoming and staying thin." People struggling with obesity are well advised to seek medical evaluation and guidance. For others who wish to take off a few pounds, researchers have offered these tips.

Begin only if you feel motivated and self-disciplined. For most people, permanent weight loss requires making a career of staying thin—a lifelong change in eating habits combined with increased exercise.

Exercise and get enough sleep. Inactive people are often overweight (**FIGURE 38.7**). Especially when supported by 7 to 8 hours of sleep a night, exercise empties fat cells, builds muscle, speeds up metabolism, and helps lower your settling point (Bennett, 1995; Kolata, 1987; Thompson et al., 1982).

Minimize exposure to tempting food cues. Food shop only on a full stomach. Keep tempting foods out of the house, and store other appealing foods out of sight.

Limit variety and eat healthy foods. Given more variety, people consume more; eat simple meals with whole grains, fruits, and vegetables. Healthy fats, such as those found in olive oil and fish, help regulate appetite and artery-clogging cholesterol (Taubes, 2001, 2002). Better crispy greens than Krispy Kremes.

Reduce portion sizes. Serve food with smaller bowls, plates, and utensils.

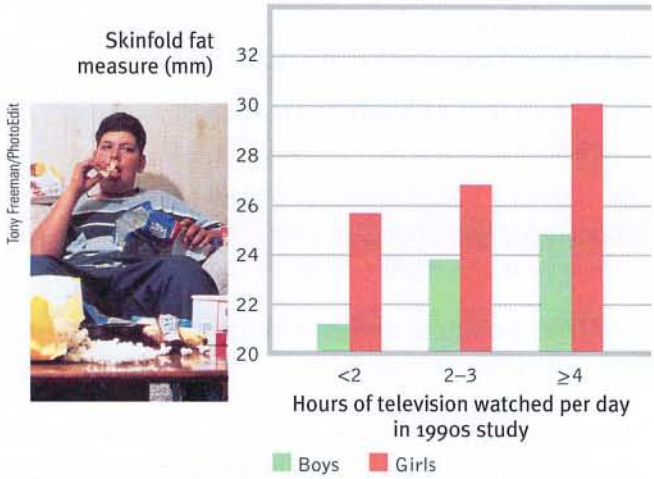
Don't starve all day and eat one big meal at night. This eating pattern, common among overweight people, slows metabolism. Moreover, those who eat a balanced breakfast are, by late morning, more alert and less fatigued (Spring et al., 1992).

Beware of the binge. Especially for men, eating slowly can lead to eating less (Martin et al., 2007). Among people who do consciously restrain their eating, drinking alcohol or feeling anxious or depressed can unleash the urge to eat (Herman & Polivy, 1980).

Before eating with others, decide how much you want to eat. Eating with friends can distract us from monitoring our own eating (Ward & Mann, 2000).

Remember, most people occasionally lapse. A lapse need not become a full collapse.

Connect to a support group. Join with others, either face-to-face or online, with whom you can share your goals and progress (Freedman, 2011).



Tony Freeman/PhotoEdit

Figure 38.7 American idle: Couch potatoes beware—TV watching correlates with obesity As lifestyles have become more sedentary and TV watching has increased, so has the percentage of overweight people in Britain, Canada, and the United States (Pagani et al., 2010). When California children were placed in a TV-reduction educational program, they watched less—and lost weight (Robinson, 1999). Don't watch TV? Then watch out for other screen time that keeps your motor idling.

Before You Move On

▶ ASK YOURSELF

Do you feel in touch with your body's hunger signals? Do you eat when your body needs food? Or do you tend to be more externally influenced by enticing foods even when you're full?

▶ TEST YOURSELF

You've skipped lunch to meet with your guidance counselor so you haven't eaten anything in eight hours. As your favorite dish is placed in front of you, your mouth waters. Even imagining this may set your mouth to watering. What triggers this anticipatory salivation?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 38 Review

38-1 What physiological factors produce hunger?

- Hunger's pangs correspond to the stomach's contractions, but hunger also has other causes.
- Neural areas in the brain, some within the hypothalamus, monitor blood chemistry (including *glucose* level) and incoming information about the body's state.
- Appetite hormones include insulin (controls blood glucose); ghrelin (secreted by an empty stomach); orexin (secreted by the hypothalamus); leptin (secreted by fat cells); and PYY (secreted by the digestive tract).
- *Basal metabolic rate* is the body's resting rate of energy expenditure.
- The body may have a *set point* (a biologically fixed tendency to maintain an optimum weight) or a looser settling point (also influenced by the environment).

38-2 What cultural and situational factors influence hunger?

- Hunger also reflects our memory of when we last ate and our expectation of when we should eat again.
- Humans as a species prefer certain tastes (such as sweet and salty), but our individual preferences are also influenced by conditioning, culture, and situation.
- Some taste preferences, such as the avoidance of new foods, or of foods that have made us ill, have survival value.

38-3 What factors predispose some people to become and remain obese?

- Genes and environment interact to produce obesity.
  - Obesity correlates with depression, especially among women.
  - Twin and adoption studies indicate that body weight is also genetically influenced.
  - Environmental influences include lack of exercise, an abundance of high-calorie food, and social influence.
- Those wishing to lose weight are advised to make a lifelong change in habits: Get enough sleep; boost energy expenditure through exercise; limit variety and minimize exposure to tempting food cues; eat healthy foods and reduce portion sizes; space meals throughout the day; beware of the binge; monitor eating during social events; forgive the occasional lapse; and connect to a support group.

Multiple-Choice Questions

1. Which of the following is the major source of energy in your body?

a. PYY
b. Arcuate nucleus
c. Hypothalamus
d. Ghrelin
e. Glucose

2. Which of the following is the best term or phrase for the body's resting rate of energy expenditure?

a. Hunger
b. Set point
c. Basal metabolic rate
d. Body chemistry
e. Settling point

3. Which of the following statements is true?

a. We eat less dessert when there are three different desserts available.
b. Serving sizes in France are generally larger than in the United States.
c. Offered a supersized portion, most of us consume fewer calories.
d. We eat more when we're around others.
e. Food variety generally decreases appetite.

Practice FRQs

1. Explain the activity of the appetite hormones insulin and leptin.

Answer

1 point: Insulin controls blood glucose.

1 point: Leptin causes the brain to increase metabolism and decrease hunger.

2. Explain the difference between set point and basal metabolic rate.

(2 points)

Module 39

Sexual Motivation


Steve Cole/Getty Images

Module Learning Objectives

39-1 Describe the human sexual response cycle, and identify the dysfunctions that disrupt it.

39-2 Discuss the impact of hormones, and external and internal stimuli, on human sexual motivation.

Sex is part of life. Had this not been so for all your ancestors, you would not be reading this book. Sexual motivation is nature's clever way of making people procreate, thus enabling our species' survival. When two people feel an attraction, they hardly stop to think of themselves as guided by their genes. As the pleasure we take in eating is nature's method of getting our body nourishment, so the desires and pleasures of sex are our genes' way of preserving and spreading themselves. Life is sexually transmitted.

sexual response cycle the four stages of sexual responding described by Masters and Johnson—excitement, plateau, orgasm, and resolution.

"It is a near-universal experience, the invisible clause on one's birth certificate stipulating that one will, upon reaching maturity, feel the urge to engage in activities often associated with the issuance of more birth certificates." -Science writer Natalie Angier, 2007

The Physiology of Sex

Like hunger, sexual arousal depends on the interplay of internal and external stimuli. To understand sexual motivation, we must consider both.

The Sexual Response Cycle

39-1 What is the human sexual response cycle, and what dysfunctions disrupt it?

In the 1960s, gynecologist-obstetrician William Masters and his collaborator Virginia Johnson (1966) made headlines by recording the physiological responses of volunteers who masturbated or had intercourse. With the help of 382 female and 312 male volunteers—a somewhat atypical sample, consisting only of people able and willing to display arousal and orgasm while being observed in a laboratory—Masters and Johnson monitored or filmed more than 10,000 sexual "cycles." Their description of the **sexual response cycle** identified four stages. During the initial *excitement phase,* men's and women's genital areas become engorged with blood, a woman's vagina expands and secretes lubricant, and her breasts and nipples may enlarge.

In the *plateau phase,* excitement peaks as breathing, pulse, and blood pressure rates continue to increase. The penis becomes fully engorged and some fluid—frequently containing enough live sperm to enable conception—may appear at its tip. Vaginal secretion continues to increase.

Masters and Johnson observed muscle contractions all over the body during *orgasm;* these were accompanied by further increases in breathing, pulse, and blood pressure rates.

At orgasm, pulse rate surges from about 70 to 115 beats per minute (Jackson, 2009). A woman's arousal and orgasm facilitate conception by positioning the uterus to receive sperm, and drawing the sperm further inward. A woman's orgasm therefore not only reinforces intercourse, which is essential to natural reproduction, it also increases retention of deposited sperm (Furlow & Thornhill, 1996).

The pleasurable feeling of sexual release apparently is much the same for both sexes. In one study, a panel of experts could not reliably distinguish between descriptions of orgasm written by men and those written by women (Vance & Wagner, 1976). University of Groningen neuroscientist Gert Holstege and his colleagues (2003a,b) understand why. They discovered that when men and women undergo PET scans while having orgasms, the same subcortical brain regions glow. And when people who are passionately in love undergo fMRI scans while viewing photos of their beloved or of a stranger, men's and women's brain responses to their partner are pretty similar (Fisher et al., 2002).

The body gradually returns to its unaroused state as the engorged genital blood vessels release their accumulated blood—relatively quickly if orgasm has occurred, relatively slowly otherwise. (It's like the nasal tickle that goes away rapidly if you have sneezed, slowly otherwise.) During this *resolution phase,* the male enters a **refractory period,** lasting from a few minutes to a day or more, during which he is incapable of another orgasm. The female's much shorter refractory period may enable her to have more orgasms if restimulated during or soon after resolution.

Sexual Dysfunctions and Paraphilias

Masters and Johnson sought not only to describe the human sexual response cycle but also to understand and treat the inability to complete it. **Sexual dysfunctions** are problems that consistently impair sexual arousal or functioning. Some involve sexual motivation, especially lack of sexual energy and arousability. For men, others include *erectile disorder* (inability to have or maintain an erection) and *premature ejaculation.* For women, the problem may be pain or *female orgasmic disorder* (distress over infrequently or never experiencing orgasm). In separate surveys of some 3000 Boston women and 32,000 other American women, about 4 in 10 reported a sexual problem, such as orgasmic disorder or low desire, but only about 1 in 8 reported that this caused personal distress (Lutfey et al., 2009; Shifren et al., 2008). Most women who experience sexual distress relate it to their emotional relationship with the partner during sex (Bancroft et al., 2003).

refractory period a resting period after orgasm, during which a man cannot achieve another orgasm.

sexual dysfunction a problem that consistently impairs sexual arousal or functioning.

Men and women with sexual dysfunctions can often be helped through therapy. In behaviorally oriented therapy, for example, men learn ways to control their urge to ejaculate, and women are trained to bring themselves to orgasm. Starting with the introduction of Viagra in 1998, erectile disorder has been routinely treated by taking a pill.

Sexual dysfunction involves problems with arousal or sexual functioning. People with *paraphilias* such as exhibitionism, fetishism, and pedophilia, do experience sexual arousal, but they direct it in unusual ways. The American Psychiatric Association (2013) only classifies such behavior as disordered if

- a person experiences distress from their unusual sexual interest or
- the sexual desire or behavior entails harm or risk of harm to others.

FYI

In a National Center for Health Statistics survey of adult Americans, using computer-assisted self-interviews that guaranteed privacy, nearly 98 percent of 30- to 59-year-olds reported having had sex with someone (Fryar et al., 2007).

Hormones and Sexual Behavior

39-2 How do hormones, and external and internal stimuli, influence human sexual motivation?

Sex hormones have two effects: They direct the physical development of male and female sex characteristics, and (especially in nonhuman animals) they activate sexual behavior. In most mammals, nature neatly synchronizes sex with fertility. The female becomes sexually receptive

(in other animals, being "in heat") when secretion of the female hormones, the **estrogens** (such as estradiol), peaks during ovulation. In experiments, researchers can stimulate receptivity by injecting female animals with an estrogen. Male hormone levels are more constant, and hormone injection does not so easily manipulate the sexual behavior of male animals (Feder, 1984). Nevertheless, castrated male rats—having lost their testes, which manufacture the male sex hormone **testosterone**—gradually lose much of their interest in receptive females. They gradually regain it if injected with testosterone.

AP® Exam Tip

The central principle here is that there are many biological processes that govern human behavior less rigidly than they govern the behaviors of other species. Because of our highly developed brain, sex hormones have less control over our behavior than they do over other animals' behavior.

In humans, hormones more loosely influence sexual behavior, although sexual desire rises slightly at ovulation among women with mates (Pillsworth et al., 2004). When at peak fertility in their menstrual cycle, women express increased preference for masculine faces and ability to detect sexual orientation, but also increased apprehensiveness of men perceived as potentially sexually coercive (Eastwick, 2009; Little et al., 2008; Navarrete et al., 2009; Rule et al., 2011). One study invited partnered women not at risk for pregnancy to keep a diary of their sexual activity. (These women were either using intrauterine devices or had undergone surgery to prevent pregnancy.) On the days around ovulation, intercourse was 24 percent more frequent (Wilcox et al., 2004).

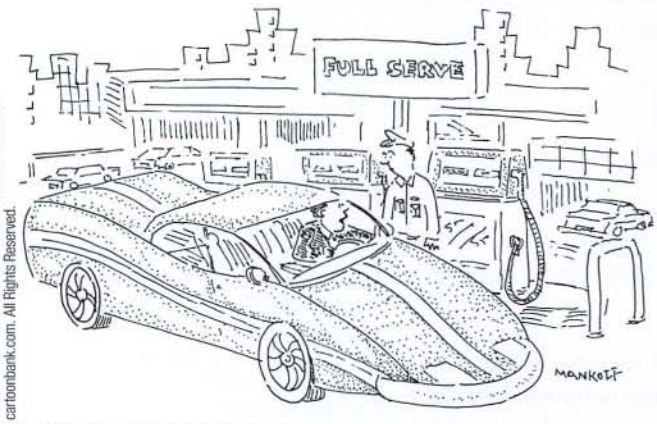
Women's sexuality differs from that of other mammalian females in being more responsive to testosterone level (van Anders & Dunn, 2009). If a woman's natural testosterone level drops, as happens with removal of the ovaries or adrenal glands, her sexual interest may wane. But testosterone-replacement therapy sometimes restores diminished sexual appetite. That is the finding of experiments with hundreds of surgically or naturally menopausal women, for whom a testosterone-replacement patch restored sexual activity, arousal, and desire more than did a placebo (Braunstein et al., 2005; Buster et al., 2005; Petersen & Hyde, 2011). For men with abnormally low testosterone levels, testosterone-replacement therapy often increases sexual desire and also energy and vitality (Yates, 2000).

estrogens sex hormones, such as estradiol, secreted in greater amounts by females than by males and contributing to female sex characteristics. In nonhuman female mammals, estrogen levels peak during ovulation, promoting sexual receptivity.

testosterone the most important of the male sex hormones. Both males and females have it, but the additional testosterone in males stimulates the growth of the male sex organs in the fetus and the development of the male sex characteristics during puberty.

In men, normal fluctuations in testosterone levels, from man to man and hour to hour, have little effect on sexual drive (Byrne, 1982). Indeed, fluctuations in male hormones are partly a *response* to sexual stimulation. In the presence of an attractive female, Australian skateboarders' testosterone surges, which contributes to riskier moves and more crash landings (Ronay & von Hippel, 2010). Thus, sexual arousal can be a cause as well as a consequence of increased testosterone levels.

Although normal short-term hormonal changes have little effect on men's and women's desire, large hormonal shifts over the life span have a greater effect. A person's interest in dating and sexual stimulation usually increases with the pubertal surge in sex hormones. If the hormonal surge is precluded—as it was during the 1600s and 1700s for prepubertal boys who were castrated to preserve their soprano voices for Italian opera—the normal development of sex characteristics and sexual desire does not occur (Peschel & Peschel, 1987). When adult men are castrated, sex drive typically falls as testosterone levels decline sharply (Hucker & Bain, 1990). Male sex offenders taking Depo-Provera, a drug that reduces testosterone levels to that of a prepubertal boy, similarly lose much of their sexual urge (Bilefsky, 2009; Money et al., 1983). In later life, as sex hormone levels decline, the frequency of sexual fantasies and intercourse declines as well (Leitenberg & Henning, 1995).

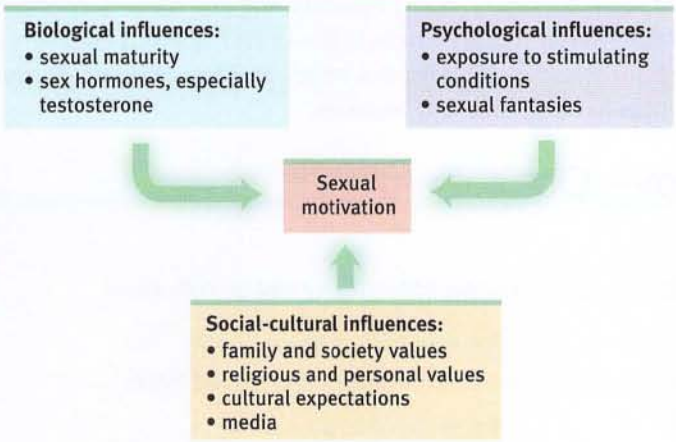


"Fill'er up with testosterone."

To summarize: We might compare human sex hormones, especially testosterone, to the fuel in a car. Without fuel, a car will not run. But if the fuel level is minimally adequate, adding more fuel to the gas tank won't change how the car runs. The analogy is imperfect, because hormones and sexual motivation interact. However, it correctly suggests that biology is a necessary but not sufficient explanation of human sexual behavior. The hormonal fuel is essential, but so are the psychological stimuli that turn on the engine, keep it running, and shift it into high gear.

The Psychology of Sex

Hunger and sex are different sorts of motivations. Hunger responds to a *need.* If we do not eat, we die. Sex is not in this sense a need. (We may feel like dying, but we do not.) Nevertheless, there are similarities between hunger and sexual motivation. Both depend on internal physiological factors. Both reflect the interplay of excitatory and inhibitory responses—the body's acceleration and braking systems (Bancroft et al., 2009). And both are influenced by external and imagined stimuli, and by cultural expectations (**FIGURE 39.1**).



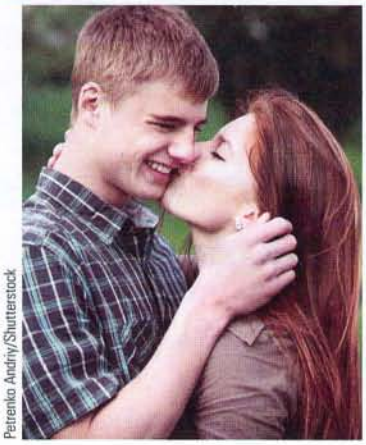

Petrenko Andriy/Shutterstock

Figure 39.1
Levels of analysis for sexual motivation Compared with our motivation for eating, our sexual motivation is less influenced by biological factors. Psychological and social-cultural factors play a bigger role.

External Stimuli

Many studies confirm that men become aroused when they see, hear, or read erotic material. Surprising to many (because sexually explicit materials are marketed mostly to men) is that most women—at least the less-inhibited women who volunteer to participate in such studies—report or exhibit nearly as much arousal to the same stimuli (Heiman, 1975; Stockton & Murnen, 1992). (Their brains do, however, respond differently, with fMRI scans revealing a more active amygdala in men viewing erotica [Hamann et al., 2004].) In 132 such experiments, men's feelings of sexual arousal have much more closely mirrored their (more obvious) genital response than have women's (Chivers et al., 2010).

People may find sexual arousal either pleasing or disturbing. (Those who wish to control their arousal often limit their exposure to such materials, just as those wishing to control hunger limit their exposure to tempting cues.) With repeated exposure, the emotional response to any erotic stimulus often lessens, or *habituates.* During the 1920s, when Western women's hemlines first reached the knee, an exposed leg was a mildly erotic stimulus.

Andrew Singer

Can sexually explicit material have adverse effects? Research indicates that it can. Depictions of women being sexually coerced—and liking it—tend to increase viewers' acceptance of the false idea that women enjoy rape, and they tend to increase male viewers' willingness to hurt women (Malamuth & Check, 1981; Zillmann, 1989). Viewing images of sexually attractive women and men may also lead people to devalue their own partners and relationships. After male collegians viewed TV or magazine depictions of sexually attractive women, they often found an average woman, or their own girlfriend or wife, less attractive (Kenrick & Gutierres, 1980; Kenrick et al., 1989; Weaver et al., 1984). Viewing X-rated sex films similarly tends to diminish people's satisfaction with their own sexual partner (Zillmann, 1989). Perhaps reading or watching erotica creates expectations that few men and women can fulfill.

"Ours is a society which stimulates interest in sex by constant titillation. . . . Cinema, television, and all the formidable array of our marketing technology project our very effective forms of titillation and our prejudices about man as a sexy animal into every corner of every hovel in the world." -Germaine Greer, 1984

Imagined Stimuli

The brain, it has been said, is our most significant sex organ. The stimuli inside our heads—our imagination—can influence sexual arousal and desire. People who, because of a spinal-cord injury, have no genital sensation can still feel sexual desire (Willmuth, 1987). Consider, too, the erotic potential of dreams. Sleep researchers have discovered that genital arousal accompanies all types of dreams, even though most dreams have no sexual content. But in nearly all men and some 40 percent of women, dreams sometimes contain sexual imagery that leads to orgasm (Wells, 1986). In men, nighttime orgasm and nocturnal emissions ("wet dreams") are more likely when orgasm has not occurred recently.

About 95 percent of both men and women say they have sexual fantasies. Men (whether gay or straight) fantasize about sex more often, more physically, and less romantically. They also prefer less personal and faster-paced sexual content in books and videos (Leitenberg & Henning, 1995). Fantasizing about sex does *not* indicate a sexual problem or dissatisfaction. If anything, sexually active people have more sexual fantasies.

Before You Move On

▶ ASK YOURSELF

What psychological and social-cultural factors have affected your sexual motivation?

▶ TEST YOURSELF

How might the evolutionary perspective, drive-reduction theory, and arousal theory explain our sexual motivation?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 39 Review

39-1 What is the human sexual response cycle, and what dysfunctions disrupt it?

- William Masters and Virginia Johnson described four stages in the human *sexual response cycle:* excitement, plateau, orgasm (which seems to involve similar feelings and brain activity in males and females), and resolution.
- In the resolution phase, males experience a *refractory period,* during which renewed arousal and orgasm are impossible.
- *Sexual dysfunctions* are problems that consistently impair sexual arousal or functioning. They can often be successfully treated by behaviorally oriented therapy or drug therapy.

39-2 How do hormones, and external and internal stimuli, influence human sexual motivation?

- The female *estrogen* and male *testosterone* hormones influence human sexual behavior less directly than they influence sexual behavior in other species. Short-term shifts in testosterone level are normal in men, partly in response to stimulation.
- External stimuli can trigger sexual arousal in both men and women, although the activated brain areas differ somewhat.
  - Men respond more specifically to sexual depictions involving their preferred sex.
  - Sexually explicit material may lead people to perceive their partners as comparatively less appealing and to devalue their relationships. Imagined stimuli (dreams and fantasies) also influence sexual arousal.

Multiple-Choice Questions

1. Which of the following best describes the relationship between gender and orgasm?

a. You can use fMRIs to identify when orgasm occurs in men, but this method is unreliable in women.
b. Men describe orgasm in physical terms and women describe orgasm in emotional terms.
c. Orgasm activates subcortical regions in men and cortical regions in women.
d. Men and women describe orgasm similarly.
e. Orgasm serves evolutionary purposes in women but not in men.

2. About _____ percent of the population experience sexual fantasies.

a. 95
b. 68
c. 50
d. 35
e. 20

3. Which of the following is true concerning the effect of sex hormones?

a. Hormone injections can be used to easily manipulate sexual behavior in males but not in females.
b. Hormone injections can be used to easily manipulate sexual behavior in both males and females.
c. Sex hormones have a more direct effect on nonhuman animals than on humans.
d. The levels of sex hormones are more constant in females than in males.
e. While studies have shown that ovulation is associated with changes in women's fantasies, they have not established an association between ovulation and women's sexual behavior.

Practice FRQs

1. Describe one influence on sexual motivation from each of the following categories:

- Biological
- Psychological
- Social-cultural

Answer

1 point: Biological: hormones, sexual orientation.

1 point: Psychological: exposure to sexually stimulating material, fantasizing.

1 point: Social-cultural: religious and personal values, media.

2. Name and briefly describe the four stages of the sexual response cycle identified by Masters and Johnson.

(4 points)

Module 40

Social Motivation: Affiliation Needs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Module Learning Objectives

40-1 Describe the evidence that points to our human affiliation need—our need to belong.

40-2 Describe how social networking influences us.

40-1 What evidence points to our human affiliation need—our need to belong?

The social stigma attached to obesity may bother an overweight person as much as, or more than, the health concerns. Why? We are what Greek philosopher Aristotle called *the social animal.* Cut off from friends or family—alone in prison or at a new school or in a foreign land—most people feel keenly their lost connections with important others. This deep *need to belong*—our *affiliation need*—seems to be a basic human motivation (Baumeister & Leary, 1995). Although healthy people vary in their wish for privacy and solitude, most of us seek to affiliate with others, even to become strongly attached to certain others in enduring, close relationships. Human beings, contended personality theorist Alfred Adler, have an "urge to community" (Ferguson, 1989, 2001, 2010). Our psychological needs drive our adaptive behaviors and, when satisfied, enhance our psychological well-being (Sheldon, 2011).

The Benefits of Belonging

Social bonds boosted our early ancestors' chances of survival. Adults who formed attachments were more likely to reproduce and to co-nurture their offspring to maturity. Attachment bonds helped keep those children close to their caregivers, protecting them from many threats. Indeed, to be "wretched" literally means, in its Middle English origin *(wrecche)*, to be without kin nearby.

Cooperation also enhanced survival. In solo combat, our ancestors were not the toughest predators. But as hunters, they learned that six hands were better than two. As food gatherers, they gained protection from two-footed and four-footed enemies by traveling in groups. Those who felt a need to belong survived and reproduced most successfully, and their genes now predominate. We are innately social creatures. People in every society on Earth belong to groups and (as Module 77 explains) prefer and favor "us" over "them."

"We must love one another or die." -W. H. Auden, "September 1, 1939"

Do you have close friends—people with whom you freely disclose your ups and downs? Having someone who rejoices with us over good news helps us feel even better about the good news, as well as about the friendship (Reis et al., 2010). The need to belong runs deeper, it seems, than the need to be rich. One study found that *very* happy university students were distinguished not by their money but by their "rich and satisfying close relationships" (Diener & Seligman, 2002).

The need to belong colors our thoughts and emotions. We spend a great deal of time thinking about actual and hoped-for relationships. When relationships form, we often feel joy. Falling in mutual love, people have been known to feel their cheeks ache from their irrepressible grins. Asked, "What is necessary for your happiness?" or "What is it that makes your life meaningful?" most people have mentioned—before anything else—close, satisfying relationships with family, friends, or romantic partners (Berscheid, 1985). Happiness hits close to home.

Consider: What was your most satisfying moment in the past week? Researchers asked that question of American and South Korean collegians, then asked them to rate how much that moment had satisfied various needs (Sheldon et al., 2001). In both countries, the peak moment had contributed most to satisfaction of self-esteem and relatedness-belonging needs. When our need for relatedness is satisfied in balance with two other basic psychological needs—*autonomy* (a sense of personal control) and *competence*—we experience a deep sense of well-being, and our self-esteem rides high (Deci & Ryan, 2002, 2009; Milyavskaya et al., 2009; Sheldon & Niemiec, 2006). Indeed, *self-esteem* is a gauge of how valued and accepted we feel (Leary et al., 1998).

Is it surprising, then, that so much of our social behavior aims to increase our feelings of belonging? To gain acceptance, we generally conform to group standards. We monitor our behavior, hoping to make a good impression. We spend billions on clothes, cosmetics, and diet and fitness aids—all motivated by our search for love and acceptance.

By drawing a sharp circle around "us," the need to belong feeds both deep attachments and menacing threats. Out of our need to define a "we" come loving families, faithful friendships, and team spirit, but also teen gangs, ethnic rivalries, and fanatic nationalism.

For good or for bad, we work hard to build and maintain our relationships. Familiarity breeds liking, not contempt. Thrown together in groups at school, at band camp, on a hiking trip, we behave like magnets, moving closer, forming bonds. Parting, we feel distress. We promise to call, to write, to come back for reunions.

This happens in part because feelings of love activate brain reward and safety systems. In one experiment involving exposure to heat, deeply-in-love university students felt markedly less pain when looking at their beloved's picture (rather than viewing someone else's photo or being distracted by a word task) (Younger et al., 2010). Pictures of our loved ones also activate a brain region associated with safety—the prefrontal cortex—that dampens feelings of physical pain (Eisenberger et al., 2011). Love is a natural painkiller.

Even when bad relationships break, people suffer. In one 16-nation survey, and in repeated U.S. surveys, separated and divorced people have been half as likely as married people to say they were "very happy" (Inglehart, 1990; NORC, 2010). After such separations, loneliness and anger—and sometimes even a strange desire to be near the former partner—linger. For those in abusive relationships, the fear of being alone sometimes seems worse than the certainty of emotional or physical pain.

Children who move through a series of foster homes or through repeated family relocations know the fear of being alone. After repeated disruption of budding attachments, they may have difficulty forming deep attachments (Oishi & Schimmack, 2010b). The evidence is clearest at the extremes—the children who grow up in institutions without a sense of belonging to anyone, or who are locked away at home and severely neglected. Too many become withdrawn, frightened, speechless. Feeling insecurely attached to others during childhood can persist into adulthood, in two main forms (Fraley et al., 2011). Some display *insecure anxious attachment,* constantly craving acceptance but remaining vigilant to signs of possible rejection. Others are trapped in *insecure avoidant attachment,* feeling such discomfort over getting close to others that they employ avoidant strategies to maintain their distance.

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AP Photo/Vincent Yu

The need to connect Six days a week, women from the Philippines work as "domestic helpers" in 154,000 Hong Kong households. On Sundays, they throng to the central business district to picnic, dance, sing, talk, and laugh. "Humanity could stage no greater display of happiness," reported one observer (*Economist*, 2001).

No matter how secure our early years were, we all experience anxiety, loneliness, jealousy, or guilt when something threatens or dissolves our social ties. Much as life's best moments occur when close relationships begin—making a new friend, falling in love, having a baby—life's worst moments happen when close relationships end (Jaremka et al., 2011). Bereaved, we may feel life is empty, pointless. Even the first weeks living on a college campus away from home can be distressing.

For immigrants and refugees moving alone to new places, the stress and loneliness can be depressing. After years of placing individual families in isolated communities, U.S. immigration policies began to encourage *chain migration* (Pipher, 2002). The second refugee Sudanese family settling in a town generally has an easier adjustment than the first.

Social isolation can put us at risk for mental decline and ill health (Cacioppo & Hawkley, 2009). But if feelings of acceptance and connection increase, so will self-esteem, positive feelings, and the desire to help rather than hurt others (Blackhart et al., 2009; Buckley & Leary, 2001).

The Pain of Being Shut Out

Can you recall feeling excluded or ignored or shunned? Perhaps you received the silent treatment. Perhaps people avoided you or averted their eyes in your presence or even mocked you behind your back. If you are like others, even being in a group speaking a different language may have left you feeling excluded, a linguistic outsider (Dotan-Eliaz et al., 2009). In one mock-interview study, women felt more excluded if interviewers used gender-exclusive language *(he, his, him)* rather than inclusive *(his or her)* or neutral *(their)* language (Stout & Dasgupta, 2011).

All these experiences are instances of *ostracism*—of social exclusion (Williams 2007, 2009). Worldwide, humans use many forms of ostracism—exile, imprisonment, solitary confinement—to punish, and therefore control, social behavior. For children, even a brief time-out in isolation can be punishing. Asked to describe personal episodes that made them feel especially *bad* about themselves, people will—about four times in five—describe a relationship difficulty (Pillemer et al., 2007). Feelings of loneliness can also spread from person to person like a disease, through one's acquaintances (Cacioppo et al., 2009).

Being shunned—given the cold shoulder or the silent treatment, with others' eyes avoiding yours—threatens one's need to belong (Williams & Zadro, 2001). "It's the meanest thing you can do to someone, especially if you know they can't fight back. I never should have been born," said Lea, a lifelong victim of the silent treatment by her mother and grandmother. Like Lea, people often respond to ostracism with depressed moods, initial efforts to restore their acceptance, and then withdrawal. After two years of silent treatment by his employer, Richard reported, "I came home every night and cried. I lost 25 pounds, had no self-esteem and felt that I wasn't worthy."

To experience ostracism is to experience real pain, as social psychologist Kipling Williams and his colleagues were surprised to discover in their studies of *cyberostracism* (Gonsalkorale & Williams, 2006). (Perhaps you can recall the feeling of being unfriended or having few followers on a social networking site, being ignored in a chat room, or having a text message or e-mail go unanswered.) Such ostracism, they discovered, takes a toll: It elicits increased activity in brain areas, such as the *anterior cingulate cortex,* that also activate in response to physical pain (Kross et al., 2011; Lieberman & Eisenberger, 2009). That helps explain another surprising finding: The pain-reliever acetaminophen (as in Tylenol and Anacin) lessens *social* as well as physical pain (DeWall et al., 2010). Across cultures, people use the same words (for example, *hurt, crushed*) for social pain and physical pain (MacDonald & Leary, 2005). Psychologically, we seem to experience social pain with the same emotional unpleasantness that marks physical pain.

Enduring the pain of ostracism
Caucasian cadets at the United States Military Academy at West Point ostracized Henry Flipper for years, hoping he would drop out. He somehow resisted their cruelty and in 1877 became the first African-American West Point graduate.

The Granger Collection, New York

CBS/Getty Images

Social acceptance and rejection Successful participants on the reality TV show *Survivor* form alliances and gain acceptance among their peers. The rest receive the ultimate social punishment as they are "voted off the island."

Pain, whatever its source, focuses our attention and motivates corrective action. Rejected and unable to remedy the situation, people may seek new friends or relieve stress in a strengthened religious faith (Aydin et al., 2010). Or they may turn nasty. In a series of experiments, researchers (Baumeister et al., 2002; Twenge et al., 2001, 2002, 2007) told some students (who had taken a personality test) that they were "the type likely to end up alone later in life," or that people they had met didn't want them in a group that was forming. They told other students that they would have "rewarding relationships throughout life," or that "everyone chose you as someone they'd like to work with." Those excluded became much more likely to engage in self-defeating behaviors and to underperform on aptitude tests. The rejection also interfered with their empathy for others and made them more likely to act in disparaging or aggressive ways against those who had excluded them (blasting them with noise, for example). "If intelligent, well-adjusted, successful . . . students can turn aggressive in response to a small laboratory experience of social exclusion," noted the research team, "it is disturbing to imagine the aggressive tendencies that might arise from . . . chronic exclusion from desired groups in actual social life." Indeed, as Williams (2007) has observed, ostracism "weaves through case after case of school violence."

FYI

Note: The researchers later debriefed and reassured the participants.

Connecting and Social Networking

40-2 How does social networking influence us?

As social creatures, we live for connection. Asked what he had learned from studying 238 Harvard University men from the 1930s to the end of their lives, researcher George Vaillant (2009) replied, "The only thing that really matters in life are your relationships to other people." A South African Zulu saying captures the idea: *Umuntu ngumuntu ngabantu*—"a person is a person through other persons."

AP® Exam Tip

Free-response questions on the AP® exam often ask students to apply psychological principles to real-life situations. It's easy to imagine a question that deals with social media.

Mobile Networks and Social Media

Look around and see humans connecting: talking, texting, posting, chatting, social gaming, e-mailing. The changes in how we connect have been fast and vast:

- Cell phones have been history's most rapidly adopted technology. At the end of 2010, the world had 7.1 billion people and 6.8 billion mobile cell-phone subscriptions (ITU, 2013). Asia and Europe have lead the way. In 2012 in India, 925 million people had mobile phone access—more than had a home toilet (Krishna, 2012; Mishra, 2013). American youth have kept up with the world: In 2013, 78 percent of 12- to 17-year-olds were cell-phone users (Pew, 2013).

"There's no question in my mind about what stands at the heart of the communication revolution—the human desire to connect."
-Skype President Josh Silverman, 2009

Image Source/SuperStock

- Texting and e-mailing have been displacing phone talking, which by 2009 accounted for less than half of U.S. mobile network traffic (Wortham, 2010). In Canada and elsewhere, e-mailing has declined, displaced by texting, Facebook, and other messaging technology (IPSOS, 2010a). Speedy texting is not really writing, said one observer (McWhorter, 2012), but rather a new form of conversation—"fingered speech."
- For many, it's as though friends, for better or worse, are always present. How many of us are using social networking sites, such as Facebook or Twitter? Among 2010's entering American collegians, 94 percent were (Pryor et al., 2011). With a "critical mass" of your friends on a social network, its lure becomes hard to resist. Such is our need to belong. Check in or miss out.

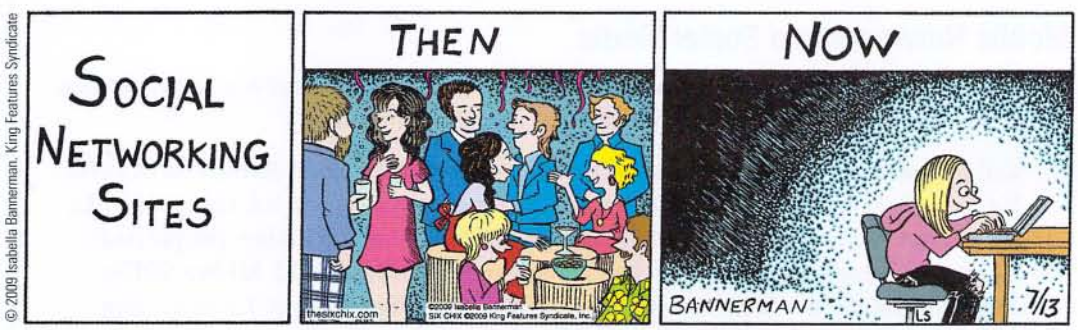
The Social Effects of Social Networking

By connecting like-minded people, the Internet serves as a social amplifier. It also functions as an online dating matchmaker (more on those topics in Module 79). As electronic communication has become part of our "new normal," researchers have explored how these changes have affected our relationships.

HAVE SOCIAL NETWORKING SITES MADE US MORE, OR LESS, SOCIALLY ISOLATED?

In the Internet's early years, when online communication in chat rooms and during social games was mostly between strangers, the adolescents and adults who spent more time online spent less time with friends (Kraut et al., 1998; Mesch, 2001; Nie, 2001). As a result, their offline relationships suffered. Even in more recent times, lonely people have tended to spend greater-than-average time online (Bonetti et al., 2010; Stepanikova et al., 2010). Social networkers have been less likely to know their real-world neighbors and "64 percent less likely than non-Internet users to rely on neighbors for help in caring for themselves or a family member" (Pew, 2009).

But the Internet has also diversified our social networks. I am now connected to other hearing-technology advocates across the world and perhaps you, too, have found a group of kindred spirits online. Despite the decrease in neighborliness, social networking seems mostly to have strengthened our connections with people we already know (DiSalvo, 2010; Valkenburg & Peter, 2009). If your social networking helps you connect with friends, stay in touch with extended family, or find support in facing challenges, then you are not alone (Rainie et al., 2011). For many, though, being alone is not the problem. If you are like other students, two days of social networking deprivation would be followed by a glut of online time, much as you would eat voraciously after a two-day food fast (Sheldon et al., 2011). Social networks connect us, but they can also become gigantic time- and attention-sucking diversions. For some research-based strategies, see Close-up: Managing Your Social Networking.



Close-up

Managing Your Social Networking

In today's world, each of us is challenged to find a healthy balance between our real-world time with people and our online sharing. In both Taiwan and the United States, excessive online socializing and gaming have been associated with lower grades (Chen & Fu, 2008; Kaiser Family Foundation, 2010). In one U.S. survey, 47 percent of the heaviest users of the Internet and other media were receiving mostly C grades or lower, as were just 23 percent of the lightest users (Kaiser Family Foundation, 2010). The heaviest users may be almost constantly connected, sometimes even awakening during the night long enough to reply to a text but not long enough to remember it the next day.

If you're trying to maintain a healthy balance between online connecting and real-world responsibilities, experts offer these practical suggestions:

- *Monitor your time.* Keep a log of how you use your time. Then ask yourself, "Does my time use reflect my priorities? Am I spending more time online than I intended? Is my time online interfering with school or work performance? Have family or friends commented on this?"
- *Monitor your feelings.* Again, ask yourself, "Am I emotionally distracted by online preoccupations? When I disconnect and move on to another activity, how do I feel?"
- *"Hide" your more distracting online friends.* And in your own postings, practice the golden rule. Before you post, ask yourself, "Is this something I'd care about reading if someone else posted it?"
- *Try turning off your mobile devices or leaving them elsewhere.* Selective attention—the flashlight of your mind—can be in only one place at a time. When you want to study or work productively, squelch the temptation to check for messages, posts, or e-mails. And disable sound alerts and pop-ups. These distractions can interrupt your work and hijack your attention just when you've managed to get focused.
- *Try a social networking fast (give it up for an hour, a day, or a week) or a time-controlled social media diet (check in only after homework is done, or only during a predetermined break).* Take notes on what you're losing and gaining on your new "diet."
- *Replenish your focus with a nature walk.* University of Michigan researchers have reported that a walk in the woods, unlike walking on a busy street, replenishes people's capacity for focused attention (Berman et al., 2008). People learn better after a peaceful walk that restores their fatigued attention.

"The solution is not to bemoan technology but to develop strategies of self-control, as we do with every other temptation in life." -Psychologist Steven Pinker, "Mind Over Mass Media," 2010

DOES ELECTRONIC COMMUNICATION STIMULATE HEALTHY SELF-DISCLOSURE?

As we will see in Module 84, confiding in others can be a healthy way of coping with day-to-day challenges. When communicating electronically rather than face to face, we often are less focused on others' reactions, less self-conscious, and thus less inhibited. We become more willing to share joys, worries, and vulnerabilities. Sometimes this is taken to an extreme, as when teens send photos of themselves they later regret, or cyberbullies hound a victim, or hate groups post messages promoting bigotry or crimes. More often, however, the increased self-disclosure serves to deepen friendships (Valkenburg & Peter, 2009).

Although electronic networking pays dividends, nature has designed us for face-to-face communication, which appears to be the better predictor of life satisfaction (Killingsworth & Gilbert, 2010; Lee et al., 2011). Texting and e-mailing are rewarding, but eye-to-eye conversation with family and friends is even more so.

DO SOCIAL NETWORKING PROFILES AND POSTS REFLECT PEOPLE'S ACTUAL PERSONALITIES?

We've all heard stories of Internet predators hiding behind false personalities, values, and motives. Generally, however, social networks reveal people's real personalities. In one study, participants completed a personality test twice. In one test, they described their "actual personality"; in the other, they described their "ideal self." Volunteers then used the participants' Facebook profiles to create an independent set of personality ratings. The ratings based on Facebook profiles were much closer to the participants' actual personalities than to

their ideal personalities (Back et al., 2010). In another study, people who seemed most likable on their Facebook page also seemed most likable in face-to-face meetings (Weisbuch et al., 2009). Your online profiles may indeed reflect the real you!

DOES SOCIAL NETWORKING PROMOTE NARCISSISM? *Narcissism* is self-esteem gone awry. Narcissistic people are self-important, self-focused, and self-promoting. Some personality tests assess narcissism with items such as "I like to be the center of attention." Given our constant social comparison—our measuring ourselves against others—many social networkers can't resist comparing numbers of friends. (Evolutionary psychologist Robin Dunbar [1992, 2010] estimates we can have meaningful, supportive relationships with about 150 people—a typical size of tribal villages.)

Those who score high on narcissism are especially active on social networking sites. They collect more superficial "friends." They offer more staged, glamorous photos. And, not surprisingly, they *seem* more narcissistic to strangers viewing their pages (Buffardi & Campbell, 2008).

For narcissists, social networking sites are more than a gathering place; they are a feeding trough. In one study, college students were randomly assigned either to edit and explain their online profile for 15 minutes, or to use that time to study and explain a Google Maps routing (Freeman & Twenge, 2010). After completing their tasks, all were tested. Who then scored higher on a narcissism measure? Those who had spent the time focused on themselves.

* * *

We have seen that identifiable physiological mechanisms drive some motives, such as hunger (though learned tastes and cultural expectations matter, too). Other motives, such as our need for affiliation, are more obviously driven by psychological factors, such as the social rewards that come from belonging. What unifies all motives is their common effect: the energizing and directing of behavior.

Before You Move On

▶ ASK YOURSELF

Have there been times when you felt out of the loop with family and friends, or even ostracized by them? How did you respond?

▶ TEST YOURSELF

How might the evolutionary perspective, drive-reduction theory, and arousal theory explain our affiliation needs?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 40 Review

40-1 What evidence points to our human affiliation need—our need to belong?

- Our need to affiliate or belong—to feel connected and identified with others—had survival value for our ancestors, which may explain why humans in every society live in groups.
- Because of their need to belong, people suffer when socially excluded, and they may engage in self-defeating behaviors (performing below their ability) or in antisocial behaviors.
- Feeling loved activates brain regions associated with reward and safety systems.
- Social isolation can put us at risk mentally and physically.

40-2 How does social networking influence us?

- We connect with others through social networking, strengthening our relationships with those we already know.
- When networking, people tend toward increased self-disclosure.
- Working out strategies for self-control and disciplined use can help people maintain a healthy balance between social networking and school and work performance.

Multiple-Choice Questions

1. If you are trying to maintain a healthy balance between connecting with others online and a real-world perspective, which of the following suggestions should you follow?

a. Monitor your feelings.
b. Dismiss the notion of logging online time.
c. Interact often with your more distracting online friends.
d. Decrease physical activity.
e. Try a social networking marathon.

2. Which of the following statements about mobile networks and social media is accurate?

a. There are more home toilets in India than there are cell phones.
b. Cell phones have been history's most rapidly adopted technology.
c. Fewer than 75 percent of American youth are cell-phone users.
d. Phone calling has displaced texting.
e. Texting has declined in Canada and elsewhere because of e-mail.

3. Which of the following words or phrases best identifies our gauge of how valued and accepted we feel?

a. Hope
b. Autonomy
c. Competence
d. Self-esteem
e. Ostracism

Practice FRQs

1. Explain three potentially negative effects of social networking.

Answer

1 point each for explaining any of the following:

Isolates us from others
Can become a time-sucking diversion
Can become an attention-sucking diversion
People may self-disclose too much
Can make us feel emotionally distracted
Other effects (use teacher discretion)

2. Explain three things you can do to manage your social networking.

(3 points)

Module 41

Theories and Physiology of Emotion


Paul Simcock/Corbis

Module Learning Objectives

41-1 Describe how arousal and expressive behaviors interact in emotion.

41-2 Explain whether we can experience emotions without consciously interpreting and labeling them.

41-3 Describe the link between emotional arousal and the autonomic nervous system, and discuss the relationship between arousal and performance.

41-4 Discuss whether different emotions activate different physiological and brain-pattern responses.

41-5 Discuss the effectiveness of polygraphs in using body states to detect lies.

Motivated behavior often is driven by powerful emotions that color and sometimes disrupt our lives. I will never forget the day I went to a huge store to drop off film and brought along Peter, my toddler first-born child. As I set Peter down on his feet and prepared to complete the paperwork, a passerby warned, "You'd better be careful or you'll lose that boy!" Not more than a few breaths later, after dropping the film in the slot, I turned and found no Peter beside me.

With mild anxiety, I peered around one end of the counter. No Peter in sight. With slightly more anxiety, I peered around the other end. No Peter there, either. Now, with my heart accelerating, I circled the neighboring counters. Still no Peter anywhere. As anxiety turned to panic, I began racing up and down the store aisles. He was nowhere to be found. Apprised of my alarm, the store manager used the public-address system to ask customers to assist in looking for a missing child. Soon after, I passed the customer who had warned me. "I told you that you were going to lose him!" he now scorned. With visions of kidnapping (strangers routinely adored that beautiful child), I braced for the possibility that my negligence had caused me to lose what I loved above all else, and that I might have to return home and face my wife without our only child.

But then, as I passed the customer service counter yet again, there he was, having been found and returned by some obliging customer. In an instant, the arousal of terror spilled into ecstasy. Clutching my son, with tears suddenly flowing, I found myself unable to speak my thanks and stumbled out of the store awash in grateful joy.


Courtesy of David G. Myers

Where do such emotions come from? Why do we have them? What are they made of? Emotions don't exist just to give us interesting experiences. They are our body's adaptive response, increasing our chances of survival. When we face challenges, emotions focus our attention and energize our actions (Cyders & Smith, 2008). Our heart races. Our pace quickens. All our senses go on high alert. Receiving unexpected good news, we may find our eyes tearing up. We raise our hands triumphantly. We feel exuberance and a newfound confidence. Yet negative and prolonged emotions can harm our health.

Cognition and Emotion

41-1 How do arousal and expressive behaviors interact in emotion?

As my panicked search for Peter illustrates, **emotions** are a mix of *bodily arousal* (heart pounding); *expressive behaviors* (quickened pace); and *conscious experience,* including thoughts ("Is this a kidnapping?") and feelings (panic, fear, joy).

The puzzle for psychologists is figuring out how these three pieces fit together. To do that, we need answers to two big questions:

- A chicken-and-egg debate: Does your bodily arousal come *before, after,* or *at the same time as* your emotional feelings? (Did I first notice my racing heart and faster step, and then feel terror about losing Peter? Or did my sense of fear come first, stirring my heart and legs to respond?)
- How do *thinking* (cognition) and *feeling* interact? Does cognition always come before emotion? (Did I think about a kidnapping threat before I reacted emotionally?)

Historical emotion theories, as well as current research, have sought to answer these questions.

FYI

Not only emotion, but most psychological phenomena (vision, sleep, memory, sex, and so forth) can be approached these three ways—physiologically, behaviorally, and cognitively.

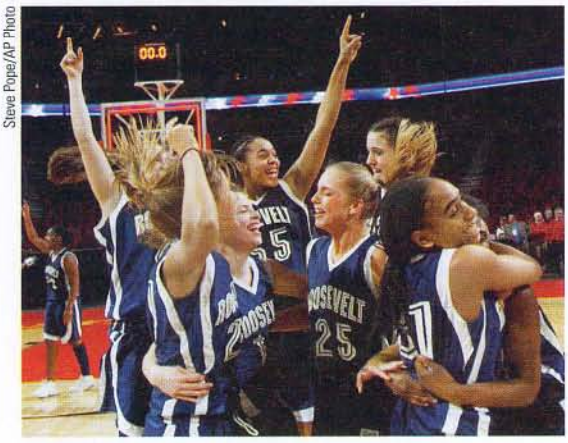
Historical Emotion Theories

JAMES-LANGE THEORY: AROUSAL COMES BEFORE EMOTION

Common sense tells most of us that we cry because we are sad, lash out because we are angry, tremble because we are afraid. First comes conscious awareness, then the feeling. But to pioneering psychologist William James, this commonsense view of emotion had things backwards. Rather, "We feel sorry because we cry, angry because we strike, afraid because we tremble" (1890, p. 1066). James' idea was also proposed by Danish physiologist Carl Lange, and so is called the **James-Lange theory.** James and Lange would guess that I noticed my racing heart and then, shaking with fright, felt the whoosh of emotion. My feeling of fear followed my body's response.

emotion a response of the whole organism, involving (1) physiological arousal, (2) expressive behaviors, and (3) conscious experience.

James-Lange theory the theory that our experience of emotion is our awareness of our physiological responses to emotion-arousing stimuli.



Steve Pope/AP Photo

Joy expressed According to the James-Lange theory, we don't just smile because we share our teammates' joy. We also share the joy because we are smiling with them.

CANNON-BARD THEORY: AROUSAL AND EMOTION OCCUR SIMULTANEOUSLY

Physiologist Walter Cannon (1871–1945) disagreed with James and Lange. Does a racing heart signal fear or anger or love? The body's responses—heart rate, perspiration, and body temperature—are too similar, and they change too slowly, to *cause* the different emotions, said Cannon. He, and later another physiologist, Philip Bard, concluded that our bodily responses and experienced emotions occur separately but simultaneously. So, according to the **Cannon-Bard theory,** my heart began pounding *as* I experienced fear. The emotion-triggering stimulus traveled to my sympathetic nervous system, causing my body's arousal. *At the same time,* it traveled to my brain's cortex, causing my awareness of my emotion. My pounding heart did not cause my feeling of fear, nor did my feeling of fear cause my pounding heart.

Cannon-Bard theory the theory that an emotion-arousing stimulus simultaneously triggers (1) physiological responses and (2) the subjective experience of emotion.

two-factor theory the Schachter-Singer theory that to experience emotion one must (1) be physically aroused and (2) cognitively label the arousal.

The Cannon-Bard theory has been challenged by studies of people with severed spinal cords, including a survey of 25 soldiers who suffered such injuries in World War II (Hohmann, 1966). Those with *lower-spine injuries,* who had lost sensation only in their legs, reported little change in their emotions' intensity. Those with *high spinal cord injury,* who could feel nothing below the neck, did report changes. Some reactions were much less intense than before the injuries. Anger, one man confessed, "just doesn't have the heat to it that it used to. It's a mental kind of anger." Other emotions, those expressed mostly in body areas above the neck, were felt *more* intensely. These men reported increases in weeping, lumps in the throat, and getting choked up when saying good-bye, worshipping, or watching a touching movie. Our bodily responses seemingly feed our experienced emotions.

But most researchers now agree that our emotions also involve cognition (Averill, 1993; Barrett, 2006). Whether we fear the man behind us on the dark street depends entirely on whether we interpret his actions as threatening or friendly.

AP® Exam Tip

Be prepared for at least a multiple-choice question that tests your ability to tell the difference between the James-Lange theory and the Cannon-Bard theory.

Cognition Can Define Emotion: Schachter and Singer

41-2 To experience emotions, must we consciously interpret and label them?

Stanley Schachter and Jerome Singer (1962) believed that an emotional experience requires a conscious interpretation of arousal: Our physical reactions and our thoughts (perceptions, memories, and interpretations) together create emotion. In their **two-factor theory,** emotions therefore have two ingredients: physical arousal and cognitive appraisal.

Consider how arousal spills over from one event to the next. Imagine arriving home after an invigorating run and finding a message that you got a longed-for job. With arousal lingering from the run, would you feel more elated than if you received this news after awakening from a nap?

The spillover effect Arousal from a soccer match can fuel anger, which can descend into rioting or other violent confrontations.

Reuters/CORBIS

To explore this *spillover effect,* Schachter and Singer injected college men with the hormone epinephrine, which triggers feelings of arousal. Picture yourself as a participant: After receiving the injection, you go to a waiting room, where you find yourself with another person (actually an accomplice of the experimenters) who is acting either euphoric or irritated. As you observe this person, you begin to feel your heart race, your body flush, and your breathing become more rapid. If you had been told to expect these effects from the injection, what would you feel? The actual volunteers felt little emotion—because they attributed their arousal to the drug. But if you had been told the injection would produce no effects, what would you feel? Perhaps you would react as another group of participants did. They "caught" the apparent emotion of the other person in the waiting room. They became happy if the accomplice was acting euphoric, and testy if the accomplice was acting irritated.

This discovery—that a stirred-up state can be experienced as one emotion or another, depending on how we interpret and label it—has been replicated in dozens of experiments (Reisenzein, 1983; Sinclair et al., 1994; Zillmann, 1986). As researcher Daniel Gilbert (2006) has noted, "Feelings that one interprets as fear in the presence of a sheer drop may be interpreted as lust in the presence of a sheer blouse." *The point to remember:* Arousal fuels emotion; cognition channels it.

Cognition May Not Precede Emotion: Zajonc, LeDoux, and Lazarus

But is the heart always subject to the mind? Must we *always* interpret our arousal before we can experience an emotion? Robert Zajonc [ZI-yence] (1980, 1984a) contended that we actually have many emotional reactions apart from, or even before, our interpretation of a situation. Perhaps you can recall liking something or someone immediately, without knowing why.

In earlier modules, we noted that when people repeatedly view stimuli flashed too briefly for them to interpret, they come to prefer those stimuli. Unaware of having previously seen them, they nevertheless rather like them. We have an acutely sensitive automatic radar for emotionally significant information, such that even a subliminally flashed stimulus can prime us to feel better or worse about a follow-up stimulus (Murphy et al., 1995; Zeelenberg et al., 2006). In experiments, thirsty people were given a fruit-flavored drink after viewing a subliminally flashed (thus unperceived) face. Those exposed to a happy face drank about 50 percent more than those exposed to a neutral face (Berridge & Winkielman, 2003). Those flashed an angry face drank substantially less.

AP® Exam Tip

Note the connections here to previous units. This paragraph relates to the nature of consciousness. The next paragraph relates to sensation and perception.

Neuroscientists are charting the neural pathways of both "bottom-up" and "top-down" emotions (Ochsner et al., 2009). Our emotional responses can follow two different brain pathways. Some emotions (especially more complex feelings like hatred and love) travel a "high road." A stimulus following this path would travel (by way of the thalamus) to the brain's cortex (**FIGURE 41.1a**). There, it would be analyzed and labeled before the command is sent out, via the amygdala (an emotion-control center), to respond.

But sometimes our emotions (especially simple likes, dislikes, and fears) take what Joseph LeDoux (2002) has called the "low road," a neural shortcut that bypasses the cortex. Following the low-road pathway, a fear-provoking stimulus would travel from the eye or ear (again via the thalamus) directly to the amygdala (Figure 41.1b). This shortcut, bypassing the cortex, enables our greased-lightning emotional response before our intellect intervenes. Like speedy

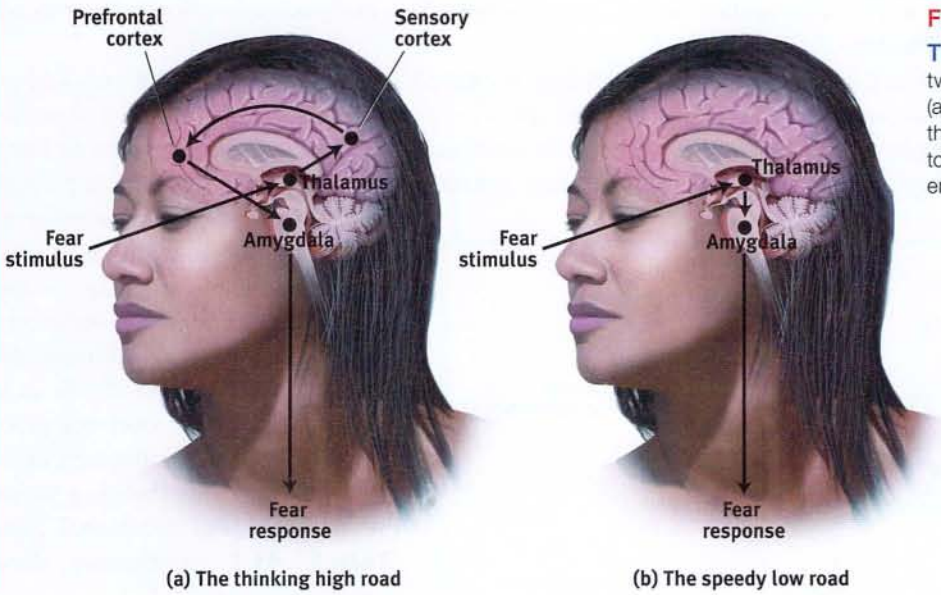


Figure 41.1

The brain's pathways for emotions In the two-track brain, sensory input may be routed (a) to the cortex (via the thalamus) for analysis and then transmission to the amygdala; or (b) directly to the amygdala (via the thalamus) for an instant emotional reaction.

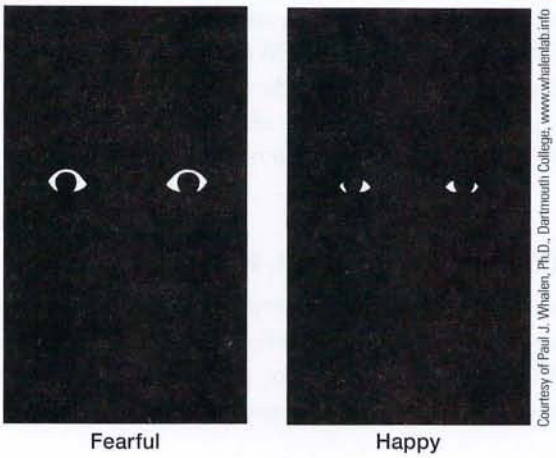


Figure 41.2
The brain's sensitivity to threats
Even when fearful eyes (left) were flashed too briefly for people to consciously perceive them, fMRI scans revealed that their hypervigilant amygdala was alerted (Whalen et al., 2004). The eyes on the right did not have this effect.

reflexes that also operate apart from the brain's thinking cortex, the amygdala reactions are so fast that we may be unaware of what's transpired (Dimberg et al., 2000). In one fascinating experiment, researchers used fMRI scans to observe the amygdala's response to subliminally presented fearful eyes (**FIGURE 41.2**) (Whalen et al., 2004). Although they were flashed too quickly for people to consciously perceive them, the fearful eyes triggered increased amygdala activity. A control condition that presented happy eyes did not trigger this activity.

The amygdala sends more neural projections up to the cortex than it receives back, which makes it easier for our feelings to hijack our thinking than for our thinking to rule our feelings (LeDoux & Armony, 1999). Thus, in the forest, we can jump at the sound of rustling bushes nearby and leave it to our cortex to decide later whether the sound was made by a snake or by the wind. Such experiences support Zajonc's belief that *some* of our emotional reactions involve no deliberate thinking.

Emotion researcher Richard Lazarus (1991, 1998) conceded that our brain processes vast amounts of information without our conscious awareness, and that some emotional responses do not require *conscious* thinking. Much of our emotional life operates via the automatic, speedy low road. But, he asked, how would we *know* what we are reacting to if we did not in some way appraise the situation? The appraisal may be effortless and we may not be conscious of it, but it is still a mental function. To know whether a stimulus is good or bad, the brain must have some idea of what it is (Storbeck et al., 2006). Thus, said Lazarus, emotions arise when we *appraise* an event as harmless or dangerous, whether we truly *know* it is or not. We appraise the sound of the rustling bushes as the presence of a threat. Later, we realize that it was "just the wind."

So, as Zajonc and LeDoux have demonstrated, some emotional responses—especially simple likes, dislikes, and fears—involve no conscious thinking (**FIGURE 41.3**). We may fear a big spider, even if we "know" it is harmless. Such responses are difficult to alter by changing our thinking. We may automatically like one person more than another. This instant appeal can even influence our political decisions if we vote (as many people do) for a candidate we *like* over the candidate expressing positions closer to our own (Westen, 2007).

But as Lazarus, Schachter, and Singer predicted, our memories, expectations, and interpretations also influence our feelings about politics. Moreover, highly emotional people are intense partly because of their interpretations. They may *personalize* events as being somehow directed at them, and they may *generalize* their experiences by blowing single incidents out of proportion (Larsen et al., 1987). Thus, learning to *think* more positively can help people *feel* better. Although the emotional low road functions automatically, the thinking high road allows us to retake some control over our emotional life. Together, automatic emotion and conscious thinking weave the fabric of our emotional lives. (**TABLE 41.1** summarizes these emotion theories.)

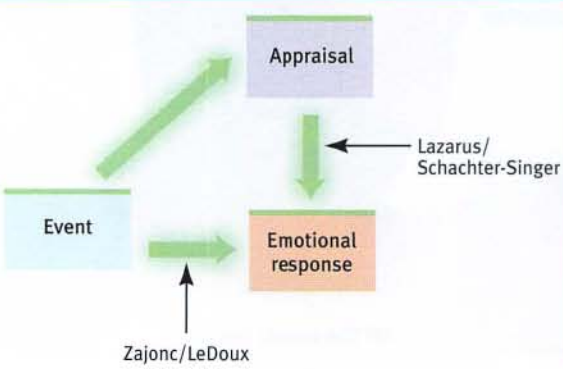


Figure 41.3
Two pathways for emotions
Zajonc and LeDoux have emphasized that some emotional responses are immediate, before any conscious appraisal. Lazarus, Schachter, and Singer emphasized that our appraisal and labeling of events also determine our emotional responses.

Table 41.1 Summary of Emotion Theories

Theory	Explanation of Emotions	Example
James-Lange	Emotions arise from our awareness of our specific bodily responses to emotion-arousing stimuli.	We observe our heart racing after a threat and then feel afraid.
Cannon-Bard	Emotion-arousing stimuli trigger our bodily responses and simultaneous subjective experience.	Our heart races at the same time that we feel afraid.
Schachter-Singer	Our experience of emotion depends on two factors: general arousal and a conscious cognitive label.	We may interpret our arousal as fear or excitement, depending on the context.
Zajonc; LeDoux	Some embodied responses happen instantly, without conscious appraisal.	We automatically feel startled by a sound in the forest before labeling it as a threat.
Lazarus	Cognitive appraisal ("Is it dangerous or not?")—sometimes without our awareness—defines emotion.	The sound is "just the wind."

AP® Exam Tip

Table 41.1 is an excellent summary of the theories of emotion. They are presented in the order of appearance historically. Notice that cognition, a hugely important factor in the modern theories, is not mentioned in the first two theories.

Before You Move On

▶ ASK YOURSELF

Can you remember a time when you began to feel upset or uneasy and only later labeled those feelings?

▶ TEST YOURSELF

Christine is holding her 8-month-old baby when a fierce dog appears out of nowhere and, with teeth bared, leaps for the baby's face. Christine immediately ducks for cover to protect the baby, screams at the dog, then notices that her heart is banging in her chest and she's broken out in a cold sweat. How would the James-Lange, Cannon-Bard, and two-factor theories explain Christine's emotional reaction?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Embodied Emotion

Whether you are falling in love or grieving a death, you need little convincing that emotions involve the body. Feeling without a body is like breathing without lungs. Some physical responses are easy to notice. Other emotional responses we experience without awareness.

Emotions and the Autonomic Nervous System

41-3 What is the link between emotional arousal and the autonomic nervous system? How does arousal affect performance?

As we saw in Module 10, in a crisis, the *sympathetic division* of your *autonomic nervous system (ANS)* mobilizes your body for action, directing your adrenal glands to release the stress hormones epinephrine (adrenaline) and norepinephrine (noradrenaline)

Autonomic Nervous System Controls Physiological Arousal

Sympathetic division (arousing)		Parasympathetic division (calming)
Pupils dilate	EYES	Pupils contract
Decreases	SALIVATION	Increases
Perspires	SKIN	Dries
Increases	RESPIRATION	Decreases
Accelerates	HEART	Slows
Inhibits	DIGESTION	Activates
Secrete stress hormones	ADRENAL GLANDS	Decrease secretion of stress hormones
Reduced	IMMUNE SYSTEM FUNCTIONING	Enhanced

Figure 41.4
Emotional arousal Like a crisis control center, the autonomic nervous system arouses the body in a crisis and calms it when danger passes.

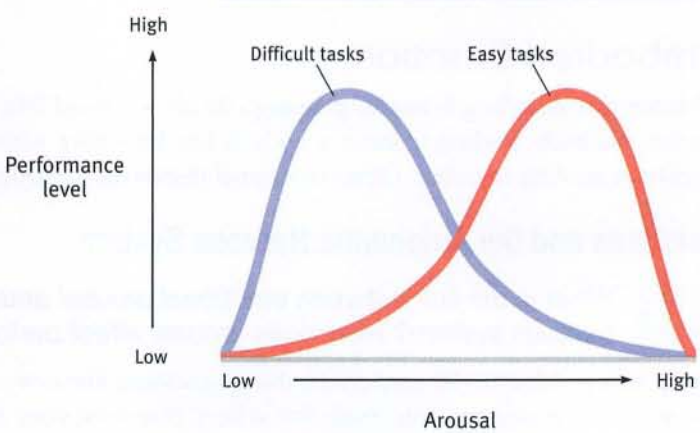
(**FIGURE 41.4**). To provide energy, your liver pours extra sugar into your bloodstream. To help burn the sugar, your respiration increases to supply needed oxygen. Your heart rate and blood pressure increase. Your digestion slows, diverting blood from your internal organs to your muscles. With blood sugar driven into the large muscles, running becomes easier. Your pupils dilate, letting in more light. To cool your stirred-up body, you perspire. If wounded, your blood would clot more quickly.

As we saw in Module 37, the *Yerkes-Dodson law* explains that arousal affects performance in different ways, depending on the task. When taking an exam, it pays to be moderately aroused—alert but not trembling with nervousness (**FIGURE 41.5**). But too little arousal (as when sleepy) can be disruptive, and, as we'll see later in this unit, prolonged high arousal can tax the body.

When the crisis passes, the *parasympathetic division* of your ANS gradually calms your body, as stress hormones slowly leave your bloodstream. After your next crisis, think of this: Without any conscious effort, your body's response to danger is wonderfully coordinated and adaptive—preparing you to *fight or flee*.

Figure 41.5
Arousal and performance
Performance peaks at lower levels of arousal for difficult tasks, and at higher levels for easy or well-learned tasks. (1) How might this phenomenon affect runners? (2) How might this phenomenon affect anxious test-takers facing a difficult exam? (3) How might the performance of anxious students be affected by relaxation training?

ANSWERS: (1) Runners tend to excel when aroused by competition. (2) High anxiety in test-takers may disrupt their performance. (3) Teaching anxious students how to relax before an exam can enable them to perform better (Hembree, 1988).



The Physiology of Emotions

41-4 Do different emotions activate different physiological and brain-pattern responses?

Imagine conducting an experiment measuring the physiological responses of emotion. In each of four rooms, you have someone watching a movie: In the first, the person is viewing a horror show; in the second, an anger-provoking film; in the third, a sexually arousing film; in the fourth, a boring film. From the control center you monitor each person's perspiration, breathing, and heart rate. Could you tell who is frightened? Who is angry? Who is sexually aroused? Who is bored?

FotoStor.co.uk/Alamy

Emotional arousal Elated excitement and panicky fear involve similar physiological arousal. That allows us to flip rapidly between the two emotions.

With training, you could probably pick out the bored viewer. But discerning physiological differences among fear, anger, and sexual arousal would be much more difficult (Barrett, 2006). Different emotions do not have sharply distinct biological signatures.

Nor do they engage sharply distinct brain regions. Consider the broad emotional portfolio of the *insula,* a neural center deep inside the brain. The insula is activated when we experience various social emotions, such as lust, pride, and disgust. In brain scans, it becomes active when people bite into some disgusting food, smell the same disgusting food, think about biting into a disgusting cockroach, or feel moral disgust over a sleazy business exploiting a saintly widow (Sapolsky, 2010).

Nevertheless, despite their similarities, sexual arousal, fear, anger, and disgust *feel* different to you and me, and they often *look* different to others. We may appear "paralyzed with fear" or "ready to explode." Research has pinpointed some real, though subtle, physiological distinctions and brain-pattern distinctions among the emotions. For example, the finger temperatures and hormone secretions that accompany fear and rage do sometimes differ (Ax, 1953; Levenson, 1992). Fear and joy, although they prompt similar increased heart rate, stimulate different facial muscles. During fear, your brow muscles tense. During joy, muscles in your cheeks and under your eyes pull into a smile (Witvliet & Vrana, 1995).

"No one ever told me that grief felt so much like fear. I am not afraid, but the sensation is like being afraid. The same fluttering in the stomach, the same restlessness, the yawning. I keep on swallowing." -C. S. Lewis, *A Grief Observed,* 1961

Some emotions also differ in their brain circuits (Panksepp, 2007). Compared with observers watching angry faces, those watching (and subtly mimicking) fearful faces show more activity in their amygdala (Whalen et al., 2001). Brain scans and EEG recordings show that emotions also activate different areas of the brain's cortex. When you experience negative emotions such as disgust, your right prefrontal cortex tends to be more active than the left. Depression-prone people, and those with generally negative personalities, also show more right frontal lobe activity (Harmon-Jones et al., 2002).

FYI

In 1966, a young man named Charles Whitman killed his wife and mother and then climbed to the top of a tower at the University of Texas and shot 38 people. An autopsy later revealed a tumor pressing against his amygdala, which may have contributed to his violence.

Positive moods tend to trigger more left frontal lobe activity. People with positive personalities—exuberant infants and alert, enthusiastic, energized, and persistently goal-directed adults—also show more activity in the left frontal lobe than in the right (Davidson, 2000, 2003; Urry et al., 2004). Indeed, the more a person's baseline frontal lobe activity tilts left—or is made to tilt left by perceptual activity—the more upbeat the person typically is (Drake & Myers, 2006).

To sum up, we can't easily see differences in emotions from tracking heart rate, breathing, and perspiration. But facial expressions and brain activity can vary with the emotion. So, do we, like Pinocchio, give off telltale signs when we lie? For more on that question, see Thinking Critically About: Lie Detection.

Thinking Critically About

Lie Detection

DreamPictures/Getty images

Can polygraph tests like this identify liars? To learn more, read on.

polygraph a machine, commonly used in attempts to detect lies, that measures several of the physiological responses (such as perspiration and cardiovascular and breathing changes) accompanying emotion.

41-5 How effective are polygraphs in using body states to detect lies?

Can a *lie detector*—a **polygraph**—reveal lies? Polygraphs don't literally detect lies. Instead, they measure emotion-linked changes in breathing, cardiovascular activity, and perspiration. If you were taking this test, an examiner would monitor these responses as you answered questions. She might ask, "In the last 20 years, have you ever taken something that didn't belong to you?" This item is a control question, aimed at making everyone a little nervous. If you lie and say *"No!"* (as many people do) the polygraph will detect arousal. This response will establish a baseline, a useful comparison for your responses to *critical questions ("Did you ever steal anything from your previous employer?")*. If your responses to critical questions are weaker than to control questions, the examiner will infer you are telling the truth.

Critics point out two problems: First, our physiological arousal is much the same from one emotion to another. Anxiety, irritation, and guilt all prompt similar physiological reactivity. Second, many innocent people do respond with heightened tension to the accusations implied by the critical questions (**FIGURE 41.6**). Many rape victims, for example, "fail" these tests when reacting emotionally but truthfully (Lykken, 1991).

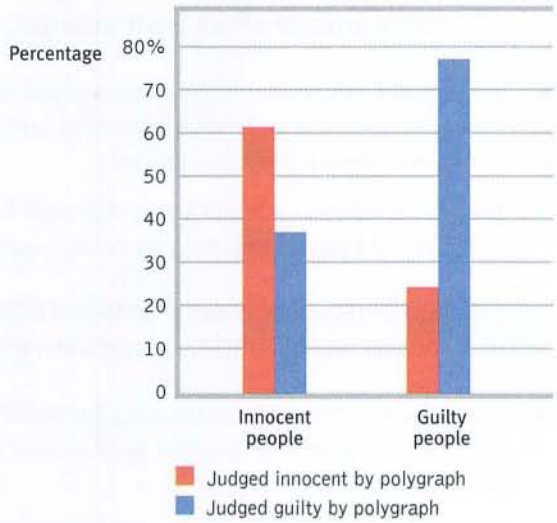
A 2002 U.S. National Academy of Sciences report noted that "no spy has ever been caught [by] using the polygraph." It is not for lack of trying. The FBI, CIA, and Departments of Defense and Energy in the United States have tested tens of thousands of employees, and polygraph use in Europe has also increased (Meijer & Verschuere, 2010). Meanwhile Aldrich Ames, a Russian spy within the CIA, went undetected. Ames took many "polygraph tests and passed them all," noted Robert Park (1999). "Nobody thought to investigate the source of his sudden wealth—after all, he was passing the lie detector tests."

A more effective approach to lie detection uses a *guilty knowledge test,* which also assesses a suspect's physiological responses to crime-scene details known only to the police and the guilty person (Ben-Shakhar & Elaad, 2003). If a camera and computer had been stolen, for example, only a guilty person should react strongly to the brand names of the stolen items. Given enough such specific probes, an innocent person will seldom be wrongly accused.

Research teams are now exploring new ways to nab liars. Psychologist Paul Ekman (2003) has done research (and has trained law enforcement officers) in detecting fleeting signals of deceit in facial expressions. Eyeblinks, for example, decrease during the cognitive demands of lying and increase afterward (Leal & Vrij, 2008). Other researchers are developing software that analyzes facial microexpressions (Adelson, 2004; Newman et al., 2003) or compares the language of truth-tellers and of liars (who use fewer first-person pronouns and more negative-emotion words).

"Forensic neuroscience" researchers are going straight to the seat of deceit—the brain. EEG recordings have revealed brain waves that indicate familiarity with crime information. fMRI scans have shown liars' brains activating in places that honest people's brains do not (Langleben et al., 2006, 2008; Lui & Rosenfeld, 2009). Pinocchio's giveaway signal of lying may be not the length of his nose, but rather the telltale activity in places such as his left frontal lobe and anterior cingulate cortex, which become active when the brain inhibits truth telling. A new U.S. $10 million Law and Neuroscience Project, led by psychologist Michael Gazzaniga, aims to assess appropriate uses of the new technology in identifying terrorists, convicting criminals, and protecting the

Thinking Critically About *(continued)*



innocent. In 2010, a U.S. federal court declared that fMRI lie detection is not yet ready for courtroom use (Miller, 2010). Many neuroscientists concur (Gazzaniga, 2011; Wagner, 2010). Others argue that jurors' and judges' seat-of-the-pants judgments "are worse than the science that is excluded" (Schauer, 2010).

Figure 41.6 How often do lie detection tests lie? In one study, polygraph experts interpreted the polygraph data of 100 people who had been suspects in theft crimes (Kleinmuntz & Szucko, 1984). Half the suspects were guilty and had confessed; the other half had been proven innocent. Had the polygraph experts been the judges, more than one-third of the innocent would have been declared guilty, and one-fourth of the guilty would have been declared innocent.

Before You Move On

▶ ASK YOURSELF

Can you think of a recent time when you noticed your body's reactions to an emotionally charged situation, such as a difficult social setting or perhaps even a test or game you were worrying about in advance? Did you perceive the situation as a challenge or a threat? How well did you do?

▶ TEST YOURSELF

How do the two divisions of the autonomic nervous system affect our emotional responses?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 41 Review

41-1 How do arousal and expressive behaviors interact in emotion?

- *Emotions* are psychological responses of the whole organism involving an interplay among physiological arousal, expressive behaviors, and conscious experience.
- Theories of emotion generally address two major questions: (1) Does physiological arousal come before, after, or at the same time as emotional feelings, and (2) how do cognition and feeling interact?
- The *James-Lange theory* maintains that emotional feelings follow our body's response to emotion-inducing stimuli.
- The *Cannon-Bard theory* proposes that our body responds to emotion at the same time that we experience the emotion (one does not cause the other).

41-2 To experience emotions, must we consciously interpret and label them?

- The Schachter-Singer *two-factor theory* holds that our emotions have two ingredients, physical arousal and a cognitive label, and the cognitive labels we put on our states of arousal are an essential ingredient of emotion.
- Lazarus agreed that many important emotions arise from our interpretations or inferences.
- Zajonc and LeDoux, however, believe that some simple emotional responses occur instantly, not only outside our conscious awareness, but before any cognitive processing occurs. This interplay between emotion and cognition illustrates our dual-track mind.

41-3 What is the link between emotional arousal and the autonomic nervous system? How does arousal affect performance?

- The arousal component of emotion is regulated by the autonomic nervous system's sympathetic (arousing) and parasympathetic (calming) divisions.
- Performance peaks at lower levels of arousal for difficult tasks, and at higher levels for easy or well-learned tasks.

41-4 Do different emotions activate different physiological and brain-pattern responses?

- Emotions may be similarly arousing, but some subtle physiological responses, such as facial muscle movements, distinguish them.
- More meaningful differences have been found in activity in some brain pathways and cortical areas and in the hormone secretions associated with different emotions.

41-5 How effective are polygraphs in using body states to detect lies?

- *Polygraphs,* which measure several physiological indicators of emotion, are not accurate enough to justify widespread use in business and law enforcement. The use of guilty knowledge questions and new forms of technology may produce better indications of lying.

Multiple-Choice Questions

1. One night Samar became frightened when she was startled by a noise while walking down the street alone. Which theory of emotion would say that her fear resulted from the startle response alone?

a. James-Lange
b. Cannon-Bard
c. Two-factor
d. Lazarus
e. Schachter-Singer

2. The Cannon-Bard theory of emotion states that

a. emotional response occurs before cognition.
b. physiological response occurs before emotional response.
c. emotional response occurs before physiological response.
d. cognition occurs before emotional response.
e. physiological response and emotion occur independently and simultaneously.

3. Which of the following is an example of cognitive appraisal?

a. Randal is happy all day because he is savoring the wonderful events of yesterday.
b. Charles is frightened in a dark alley because he remembers stories of others being attacked in dark alleys.
c. Sherika labels the arousal she is feeling as attraction because she is in the presence of a good-looking young man.
d. Dora is angry because she cannot figure out how to convince her husband to take her to Hawaii.
e. Ann is frustrated because traffic has made her late for an important meeting.

4. Which of the following characterizes the "low road" neural pathway to emotions?

a. Information travels directly from the thalamus to the amygdala.
b. The emotion results more slowly than it would via the "high road."
c. It is an example of top-down processing.
d. It is more likely to be utilized for complex feelings.
e. It passes through the brain's cortex.

Practice FRQs

1. Explain the role of conscious thinking in emotion according to the theory that some emotions take the high road while others take the low road.

Answer

1 point: The high-road theory argues that conscious thinking occurs before the emotion.

1 point: The low-road theory argues that conscious awareness does not occur until after the emotional response.

2. Lynn's boyfriend has not replied to her last three text messages. Lynn is experiencing anger, increased blood pressure, and rapid breathing. Analyze this situation using both the James-Lange and the Cannon-Bard theories of emotion.

(2 points)

Module 42

Expressed Emotion


Ocean/Corbis

Module Learning Objectives

42-1 Describe our ability to communicate nonverbally, and discuss gender differences in this capacity.

42-2 Discuss the culture-specific and culturally universal aspects of nonverbal expressions of emotion.

42-3 Describe how facial expressions influence our feelings.

Expressive behavior implies emotion. Dolphins, with smiles seemingly plastered on their faces, appear happy. To decipher people's emotions we read their bodies, listen to their voice tones, and study their faces. Does nonverbal language vary with culture—or is it universal? And do our expressions influence our experienced emotions?

"Your face, my thane, is a book where men may read strange matters." -Lady Macbeth to her husband, in William Shakespeare's *Macbeth*

FYI

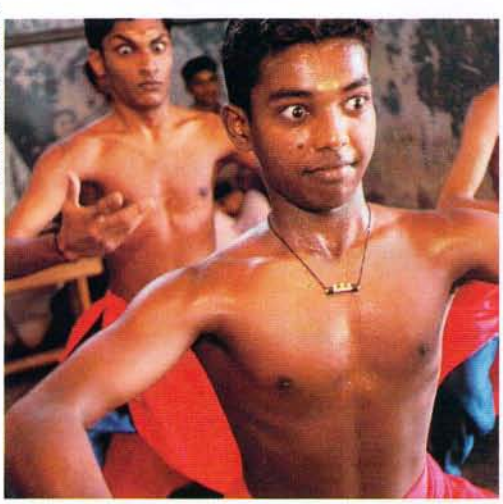
To learn more about our experienced emotions of anger and happiness, see Module 83.

Detecting Emotion in Others

42-1 How do we communicate nonverbally? How do the genders differ in this capacity?

To Westerners, a firm handshake conveys an outgoing, expressive personality (Chaplin et al., 2000). A gaze, an averted glance, or a stare communicate intimacy, submission, or dominance (Kleinke, 1986). When two people are passionately in love, they typically spend time—quite a bit of time—gazing into each other's eyes (Rubin, 1970). Would such gazes stir these feelings between strangers? To find out, researchers asked unacquainted male-female pairs to gaze intently for two minutes either at each other's hands or into each other's eyes. After separating, the eye gazers reported feeling a tingle of attraction and affection (Kellerman et al., 1989).

Most of us read nonverbal cues well. Shown 10 seconds of video from the end of a speed-dating interaction, people can often detect whether one person is attracted to another (Place et al., 2009). We are especially good at detecting nonverbal threats. In a series of subliminally flashed words, we more often sense the presence of negative ones, such as *snake* or *bomb* (Dijksterhuis & Aarts, 2003). In a crowd of faces, a single angry face "pops out" faster than a single happy one (Hansen & Hansen, 1988; Pinkham et al., 2010). And even when hearing another language, most of us readily detect anger (Scherer et al., 2001).


Network Photographers/Alamy

A silent language of emotion Hindu classic dance uses the face and body to effectively convey 10 different emotions (Hejmadi et al., 2000).

Pollak, S.D. and Kistler, D.J. (2002). Proceedings of the National Academy of Sciences USA, 99: 13, 9072–9076.

Figure 42.1

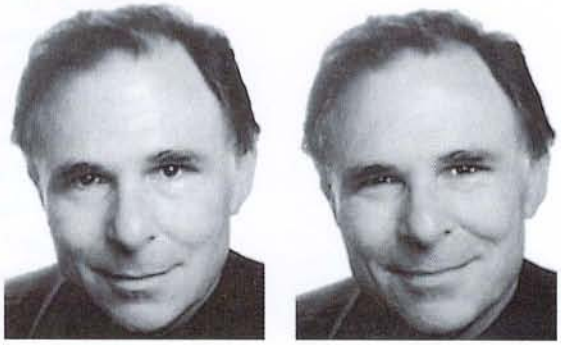
Experience influences how we perceive emotions
Viewing the morphed middle face, evenly mixing fear with anger, physically abused children were more likely than nonabused children to perceive the face as angry (Pollak & Kistler, 2002; Pollak & Tolley-Schell, 2003).

Experience can sensitize us to particular emotions, as shown by experiments using a series of faces (like those in **FIGURE 42.1**) that morph from fear (or sadness) to anger. Viewing such faces, physically abused children are much quicker than other children to spot the signals of anger. Shown a face that is 60 percent fear and 40 percent anger, they are as likely to perceive anger as fear. Their perceptions become sensitively attuned to glimmers of danger that nonabused children miss.

Hard-to-control facial muscles reveal signs of emotions you may be trying to conceal. Lifting just the inner part of your eyebrows, which few people do consciously, reveals distress or worry. Eyebrows raised and pulled together signal fear. Activated muscles under the eyes and raised cheeks suggest a natural smile, called a *Duchenne smile* in honor of the French physician who described it. A feigned smile, such as one we make for a photographer, often is frozen in place for several seconds, then suddenly switched off. Authentic smiles tend to be briefer and to fade less abruptly (Bugental, 1986).

Our brains are rather amazing detectors of subtle expressions. Just *how* amazing was clear when researchers filmed teachers talking to unseen schoolchildren (Babad et al., 1991). A mere 10-second clip of either the teacher's voice or face provided enough clues for both young and old viewers to determine whether the teacher liked and admired a child. In other experiments, even glimpsing a face for one-tenth of a second enabled people to judge people's attractiveness or trustworthiness or to rate politicians' competence and predict their voter support (Willis & Todorov, 2006). "First impressions . . . occur with astonishing speed," note Christopher Olivola and Alexander Todorov (2010).

Despite our brain's emotion-detecting skill, we find it difficult to detect deceiving expressions (Porter & ten Brinke, 2008). In one digest of 206 studies of discerning truth from lies, people were just 54 percent accurate—barely better than a coin toss (Bond & DePaulo, 2006). Moreover, contrary to claims that some experts can spot lies, the available research indicates that virtually no one—save perhaps police professionals in high-stakes situations—beats chance by much (Bond & DePaulo, 2008; O'Sullivan et al., 2009). The behavioral differences between liars and truth-tellers are too minute for most people to detect (Hartwig & Bond, 2011).



Paul Ekman

Which of researcher Paul Ekman's smiles is feigned, which natural? The smile on the right engages the facial muscles of a natural smile.

Some of us are, however, more sensitive than others to physical cues. In one study, hundreds of people were asked to name the emotion in brief film clips they watched. The clips showed portions of a person's emotionally expressive face or body, sometimes accompanied by a garbled voice (Rosenthal et al., 1979). For example, after a 2-second scene revealing only the face of an upset woman, the researchers would ask whether the woman was criticizing someone for being late or was talking about her divorce. Given such "thin slices," some people were much better emotion detectors than others. Introverts tend to excel at reading others' emotions, while extraverts are generally easier to read (Ambady et al., 1995).

Gestures, facial expressions, and voice tones, which are absent in written communication, convey important information. Those who listen to 30 seconds of people describing their marital separation can better predict their current and future adjustment than can those who read a script of the recording (Mason et al., 2010). Electronic communications provide impoverished nonverbal cues. To partly remedy that, we sometimes accompany our text messages, e-mails, and online posts with emotion cues (ROFL!). The absence of expressive e-motion

can make for ambiguous emotion. Without the vocal nuances that signal whether a statement is serious, kidding, or sarcastic, we are in danger of communicating our own egocentrism, as people misinterpret our "just kidding" message (Kruger et al., 2005).

Images.com/Corbis

Obvious emotions Graphic novel authors use facial expressions and other design elements to express emotion, reducing the need to explain how the characters are feeling.

Gender, Emotion, and Nonverbal Behavior

Is women's intuition, as so many believe, superior to men's? After analyzing 125 studies of sensitivity to nonverbal cues, Judith Hall (1984, 1987) concluded that women generally do surpass men at reading people's emotional cues when given "thin slices" of behavior. Women have also surpassed men in other assessments of emotional cues, such as deciding whether a male-female couple is a genuine romantic couple or a posed phony couple, and in discerning which of two people in a photo is the other's supervisor (Barnes & Sternberg, 1989).

Women's nonverbal sensitivity helps explain their greater emotional literacy. Invited by Lisa Feldman Barrett and her colleagues (2000) to describe how they would feel in certain situations, men described simpler emotional reactions. You might like to try this yourself: Ask some people how they might feel when saying good-bye to friends after graduation. Barrett's work suggests you are more likely to hear young men say, simply, "I'll feel bad," and to hear young women express more complex emotions: "It will be bittersweet; I'll feel both happy and sad."

Women's skill at decoding others' emotions may also contribute to their greater emotional responsiveness (Vigil, 2009). In studies of 23,000 people from 26 cultures around the world, women more than men reported themselves open to feelings (Costa et al., 2001). That helps explain the extremely strong perception that emotionality is "more true of women"—a perception expressed by nearly 100 percent of 18- to 29-year-old Americans (Newport, 2001). But the perception of women's emotionality also feeds—and is fed by—people's attributing women's emotionality to their disposition and men's to their circumstances: "She's emotional. He's having a bad day" (Barrett & Bliss-Moreau, 2009).

One exception: Anger strikes most people as a more masculine emotion. Quickly: Imagine an angry face. What gender is the person? If you're like 3 in 4 Arizona State University students, you imagined a male (Becker et al., 2007). The researchers also found that when a gender-neutral face was made to look angry, most people perceived it as male. If the face was smiling, they were more likely to perceive it as female (**FIGURE 42.2**).

When surveyed, women are also far more likely than men to describe themselves as empathic. If you have *empathy,* you identify with others and imagine what it must be like to walk in their shoes. You rejoice with those who rejoice and weep with those who weep. Children and adults who skillfully infer others' thoughts and feelings tend to enjoy positive peer relationships (Gleason et al., 2009).

Figure 42.2

Male or female? Researchers manipulated a gender-neutral face. People were more likely to see it as a male when it wore an angry expression, and as a female when it wore a smile (Becker et al., 2007).

©APA/Vaughn Becker

Physiological measures of empathy, such as one's heart rate while seeing another's distress, confirm a gender gap, though a smaller one than is indicated in survey self-reports (Eisenberg & Lennon, 1983; Rueckert et al., 2010). Females are also more likely to *express* empathy—to cry and to report distress when observing someone in distress. As **FIGURE 42.3** shows, this gender difference was clear in videotapes of male and female students watching film clips that were sad (children with a dying parent), happy (slapstick comedy), or frightening (a man nearly falling off the ledge of a tall building) (Kring & Gordon, 1998). Women also tend to experience emotional events, such as viewing pictures of mutilation, more deeply, with more brain activation in areas sensitive to emotion. And they are better at remembering the scenes three weeks later (Canli et al., 2002).

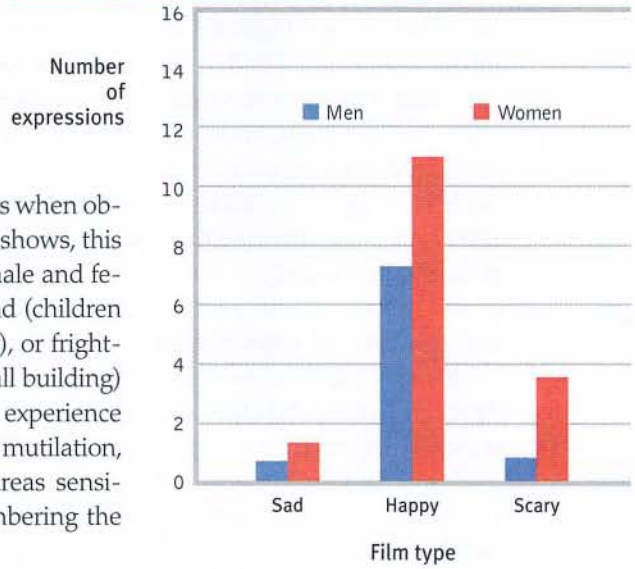


Figure 42.3
Gender and expressiveness
Male and female film viewers did not differ dramatically in self-reported emotions or physiological responses. But the women's faces *showed* much more emotion. (From Kring & Gordon, 1998.)

Culture and Emotional Expression

42-2 How are nonverbal expressions of emotion understood within and across cultures?

The meaning of *gestures* varies with the culture. Former U.S. President Richard Nixon learned this while traveling in Brazil; he made the North American "A-OK" sign, not realizing it was a crude insult to Brazilians. The importance of cultural definitions of gestures and other body language was again demonstrated in 1968, when North Korea publicized photos of supposedly happy officers from a captured U.S. Navy spy ship. In the photo, three men had raised their middle finger, telling their captors it was a "Hawaiian good luck sign" (Fleming & Scott, 1991).

Do facial expressions also have different meanings in different cultures? To find out, two investigative teams showed photographs of various facial expressions to people in different parts of the world and asked them to guess the emotion (Ekman et al., 1975, 1987, 1994; Izard, 1977, 1994). You can try this matching task yourself by pairing the six emotions with the six faces of **FIGURE 42.4**.

1988 Matsumoto, Japanese & Caucasian Facial Expression of Emotion

Figure 42.4
Culture-specific or culturally universal expressions?
As people of differing cultures and races, do our faces speak differing languages? Which face expresses disgust? Anger? Fear? Happiness? Sadness? Surprise? (From Matsumoto & Ekman, 1989.) See inverted answers below.

From left to right, top to bottom: happiness, surprise, fear, sadness, anger, disgust.

Regardless of your cultural background, you probably did pretty well. A smile's a smile the world around. Ditto for anger, and to a lesser extent the other basic expressions (Elfenbein & Ambady, 1999). (There is no culture where people frown when they are happy.)

Facial expressions do convey some nonverbal accents that provide clues to one's culture (Marsh et al., 2003). Thus data from 182 studies show slightly enhanced accuracy when people judge emotions from their own culture (Elfenbein & Ambady, 2002, 2003a,b). Still, the telltale signs of emotion generally cross cultures. The world over, children cry when distressed, shake their heads when defiant, and smile when they are happy. So, too, with blind children who have never seen a face (Eibl-Eibesfeldt, 1971). People blind from birth spontaneously exhibit the common facial expressions associated with such emotions as joy, sadness, fear, and anger (Galati et al., 1997).

"For news of the heart, ask the face." -GUINEAN PROVERB

Musical expressions also cross cultures. Happy and sad music feels happy and sad around the world. Whether you live in an African village or a European city, fast-paced music seems happy, and slow-paced music seems sadder (Fritz et al., 2009).

Do these shared emotional categories reflect shared cultural experiences, such as movies and TV broadcasts seen around the world? Apparently not. Paul Ekman and his team asked isolated people in New Guinea to respond to such statements as, "Pretend your child has died." When North American collegians viewed the taped responses, they easily read the New Guineans' facial reactions.

So we can say that facial muscles speak a universal language. This discovery would not have surprised Charles Darwin (1809–1882) who argued that in prehistoric times, before our ancestors communicated in words, they communicated threats, greetings, and submission with facial expressions. Their shared expressions helped them survive (Hess & Thibault, 2009). A sneer, for example, retains elements of an animal baring its teeth in a snarl. Emotional expressions may enhance our survival in other ways, too. Surprise raises the eyebrows and widens the eyes, enabling us to take in more information. Disgust wrinkles the nose, closing it from foul odors.

FYI

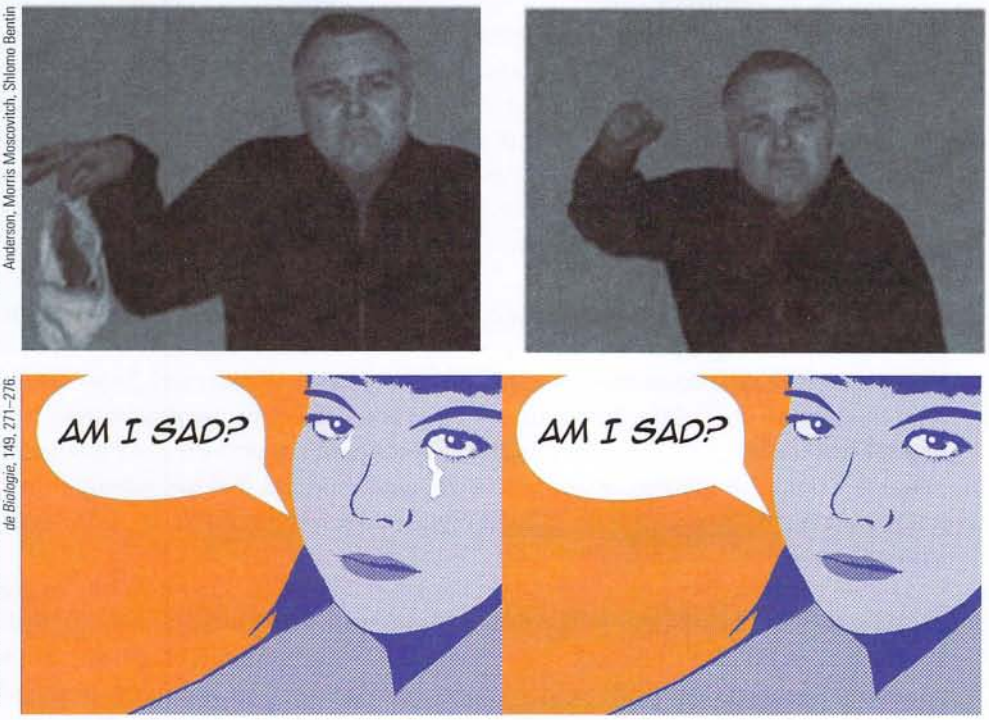
While weightless, astronauts' internal bodily fluids move toward their upper body and their faces become puffy. This makes nonverbal communication more difficult, especially among multinational crews (Gelman, 1989).

Smiles are social as well as emotional events. Bowlers seldom smile when they score a strike; they smile when they turn to face their companions (Jones et al., 1991; Kraut & Johnston, 1979). Euphoric Olympic gold-medal winners typically don't smile when they are awaiting their ceremony. But they wear broad grins when interacting with officials and facing the crowd and cameras (Fernández-Dols & Ruiz-Belda, 1995). Thus, a glimpse at competitors' spontaneous expressions following an Olympic judo competition gives a very good clue to who won, no matter their country (Matsumoto et al., 2006). Even natively blind athletes, who have never observed smiles, display the same social smiles in such situations (Matsumoto & Willingham, 2009).

Although we share a universal facial language, it has been adaptive for us to interpret faces in particular contexts (**FIGURE 42.5**). People judge an angry face set in a frightening situation as afraid. They judge a fearful face set in a painful situation as pained (Carroll & Russell, 1996). Movie directors harness this phenomenon by creating contexts and soundtracks that amplify our perceptions of particular emotions.

Although cultures share a universal facial language for basic emotions, they differ in how *much* emotion they express. Those that encourage individuality, as in Western Europe, Australia, New Zealand, and North America, display mostly visible emotions (van Hemert et al., 2007). Those that encourage people to adjust to others, as in China, tend to have less visible displays of personal emotions (Matsumoto et al., 2009; Tsai et al., 2007). In Japan, people infer emotion more from the surrounding context. Moreover, the mouth, which is so expressive in North Americans, conveys less emotion than do the telltale eyes (Masuda et al., 2008; Yuki et al., 2007).

Cultural differences also exist *within* nations. The Irish and their Irish-American descendants tend to be more expressive than Scandinavians and their Scandinavian-



Angry, Disgusted, or Afraid?: Studies on the Malleability of Emotion Perception, Hillel Aviezer, Ran R. Hassin, Jennifer Ryan, Cheryl Grady, Josh Susskind, Adam Anderson, Morris Moscovitch, Shlomo Bentin

R.R. Provine. Emotional tears and NGF: A biographical appreciation and research beginning. *Archives Italiennes de Biologie*, 149, 271–276.

Figure 42.5
We read faces in context
Whether we perceive the man in the top row as disgusted or angry depends on which body his face appears on (Aviezer et al., 2008). In the second row, tears on a face make its expression seem sadder (Provine et al., 2009).

American descendants (Tsai & Chentsova-Dutton, 2003). And that reminds us of a familiar lesson: Like most psychological events, emotion is best understood not only as a biological and cognitive phenomenon, but also as a social-cultural phenomenon.

The Effects of Facial Expressions

42-3 How do our facial expressions influence our feelings?

As William James (1890) struggled with feelings of depression and grief, he came to believe that we can control emotions by going "through the outward movements" of any emotion we want to experience. "To feel cheerful," he advised, "sit up cheerfully, look around cheerfully, and act as if cheerfulness were already there."

Studies of the emotional effects of facial expressions reveal precisely what James might have predicted. Expressions not only communicate emotion, they also amplify and regulate it. In *The Expression of the Emotions in Man and Animals,* Charles Darwin (1872) contended that "the free expression by outward signs of an emotion intensifies it. . . . He who gives way to violent gestures will increase his rage."

"Whenever I feel afraid
I hold my head erect
And whistle a happy tune."
-Richard Rodgers and Oscar Hammerstein, *The King and I*, 1958

Was Darwin right? You can test his hypothesis: Fake a big grin. Now scowl. Can you feel the "smile therapy" difference? Participants in dozens of experiments have felt a difference. For example, James Laird and his colleagues (1974, 1984, 1989) subtly induced students to make a frowning expression by asking them to "contract these muscles" and "pull your brows together" (supposedly to help the researchers attach facial electrodes). The results? The students reported feeling a little angry. So, too, for other basic emotions. For example, people reported feeling more fear than anger, disgust, or sadness when made to construct a fearful expression: "Raise your eyebrows. And open your eyes wide. Move your whole head back, so that your chin is tucked in a little bit, and let your mouth relax and hang open a little" (Duclos et al., 1989).

facial feedback effect
the tendency of facial muscle states to trigger corresponding feelings such as fear, anger, or happiness.

This **facial feedback effect** has been repeated many times, in many places, for many basic emotions (**FIGURE 42.6**). Just activating one of the smiling muscles by holding a pen in the teeth (rather than with the lips, which activates a frowning muscle) is enough to make cartoons seem more amusing (Strack et al., 1988). A heartier smile—made not just with the mouth but with raised cheeks that crinkle the eyes—enhances positive feelings even more when you are reacting to something pleasant or funny (Soussignan, 2001). Smile warmly on the outside and you feel better on the inside. When smiling, you will even more quickly understand sentences that describe pleasant events (Havas et al., 2007). Scowl and the whole world seems to scowl back.

So your face is more than a billboard that displays your feelings; it also feeds your feelings. No wonder depressed patients reportedly feel better after between-the-eyebrows Botox injections that paralyze the frowning muscles (Finzi & Wasserman, 2006). Two months after the treatment, 9 of the 10 nonfrowning patients given this treatment were no longer depressed. Follow-up studies have found that Botox paralysis of the frowning muscles slows people's reading of sadness or anger-related sentences, and it slows activity in emotion-related brain circuits (Havas et al., 2010; Hennenlotter et al., 2008). In such ways, Botox smooths life's emotional wrinkles.

Other researchers have observed a similar *behavior feedback* phenomenon (Snodgrass et al., 1986). You can duplicate the participants' experience: Walk for a few minutes with short, shuffling steps, keeping your eyes downcast. Now walk around taking long strides, with your arms swinging and your eyes looking straight ahead. Can you feel your mood shift? Going through the motions awakens the emotions.

Likewise, people perceive ambiguous behaviors differently depending on which finger they move up and down while reading a story. (This was said to be a study of the effect of using finger muscles "located near the reading muscles on the motor cortex.") If participants read the story while moving an extended middle finger, the story behaviors seemed more hostile. If read with a thumb up, they seemed more positive. Hostile gestures prime hostile perceptions (Chandler & Schwarz, 2009; Goldin-Meadow & Beilock, 2010).

You can use your understanding of feedback effects to become more empathic: Let your own face mimic another person's expression. Acting as another acts helps us feel what another feels (Vaughn & Lanzetta, 1981). Indeed, natural mimicry of others' emotions helps explain why emotions are contagious (Dimberg et al., 2000; Neumann & Strack, 2000). Primates also ape one another, and such synchronized expressions help bond them (and us) together (de Waal, 2009). One social worker with Moebius syndrome, a rare facial paralysis disorder, struggled to make emotional connections with Hurricane Katrina refugees. When people made a sad expression, "I wasn't able to return it. I tried to do so with words and tone of voice, but it was no use. Stripped of the facial expression, the emotion just dies there, unshared" (Carey, 2010).

Figure 42.6
How to make people smile without telling them to smile
Do as Kazuo Mori and Hideko Mori (2009) did with students in Japan: Attach rubber bands to the sides of the face with adhesive bandages, and then run them either over the head or under the chin. (1) Based on the facial feedback effect, how might students report feeling when the rubber bands raise their cheeks as though in a smile? (2) How might students report feeling when the rubber bands pull their cheeks downward?

ANSWERS: (1) Most students report feeling more happy than sad when their cheeks are raised upward. (2) Most students report feeling more sad than happy when their cheeks are pulled downward.

* * *

How do our emotions, personality, attitudes, and behaviors influence our risk of disease? What can we do to prevent illness and promote health? To study how stress and healthy and unhealthy behaviors influence health and illness, psychologists and physicians created the interdisciplinary field of *behavioral medicine,* integrating behavioral and medical knowledge. **Health psychology** provides psychology's contribution to behavioral medicine. Let's consider some of psychology's findings on stress and ways of coping with it.

health psychology a subfield of psychology that provides psychology's contribution to behavioral medicine.

Before You Move On

▶ ASK YOURSELF

Can you think of one situation in which you would like to change the way you feel, and create a simple plan for doing so? For instance, if you would like to feel more cheerful on your way to class tomorrow morning rather than dragging yourself there, you might try walking briskly—with head held high and a pleasant expression on your face.

▶ TEST YOURSELF

Who tends to express more emotion—men or women? How do we know the answer to that question?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 42 Review

42-1 How do we communicate nonverbally? How do the genders differ in this capacity?

- Much of our communication is through body movements, facial expressions, and voice tones. Even seconds-long filmed slices of behavior can reveal feelings.
- Women tend to read emotional cues more easily and to be more empathic.

42-2 How are nonverbal expressions of emotion understood within and across cultures?

- The meaning of gestures varies with culture, but facial expressions, such as those of happiness and fear, are common the world over.
- Cultures also differ in the amount of emotion they express.

42-3 How do our facial expressions influence our feelings?

- Research on the *facial feedback effect* shows that our facial expressions can trigger emotional feelings and signal our body to respond accordingly.
- We also mimic others' expressions, which helps us empathize.

Multiple-Choice Questions

1. What do we call the tendency of facial muscle states to trigger corresponding feelings such as fear, anger, or happiness?

a. Culture-specific expression
b. Moebius syndrome
c. Botox
d. Facial feedback effect
e. Culturally universal expression

2. Which of the following statements is most accurate regarding emotion?

a. Smiles are neither social nor emotional events.
b. Inhabitants of individualist countries are more likely to display nonverbal emotions than inhabitants of collectivist countries.
c. Mouths convey more emotion than eyes.
d. Natively blind people who have never seen a smile will never generate a smile.
e. Cultures share a universal facial language for basic emotions.

3. Which subfield of psychology provides psychology's contribution to behavioral medicine?

a. Cognitive
b. Health
c. Clinical
d. Educational
e. Community

Practice FRQs

1. Name the phenomenon describing the impact facial expressions can have on our disposition, and give an example.

Answer

1 point: The facial feedback effect.

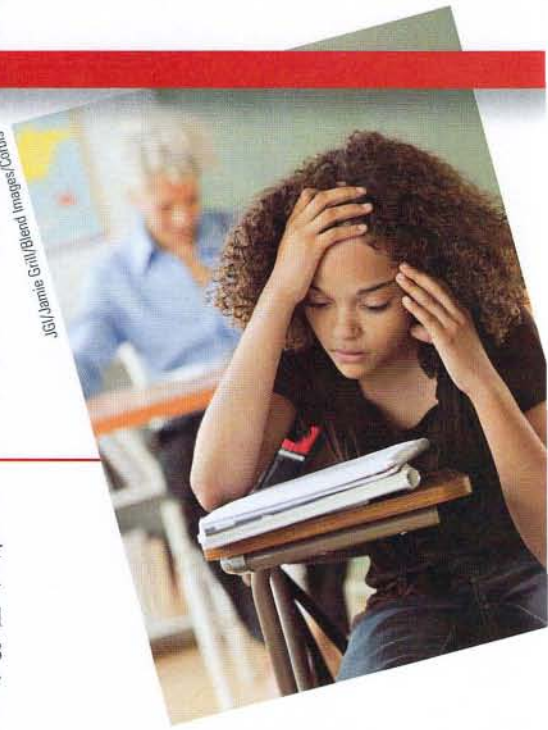
1 point: For example, smiling makes you feel happy and frowning makes you feel a little angry.

2. Name four pieces of evidence that suggest women are more empathic than men.

(4 points)

Module 43

Stress and Health



JGI/Jamie Grill/Blend Images/Corbis

Module Learning Objective

43-1 Identify events that provoke stress responses, and describe how we respond and adapt to stress.

How often do you experience stress in your daily life? Never? Rarely? Sometimes? Or frequently? When pollsters put a similar question to college students, some 85 percent recalled experiencing stress during the last three months—and most said it had disrupted their schoolwork at least once (AP, 2009). On entering college or university, 18 percent of men and 41 percent of women reported having been "frequently overwhelmed" by all they had to do during the past year (Pryor et al., 2012).

For many students, the high school years, with their new relationships and more demanding challenges, prove stressful. Deadlines become relentless and intense at the end of each term. The time demands of volunteering, sports, music and theater, work, college prep courses, and college applications combine with occasional family tensions and success pressures. Sometimes it's enough to give you a headache or disrupt sleep.

FYI

In Module 84, we take a close look at some ways we can reduce the stress in our lives, so that we can flourish in both body and mind.

Stress often strikes without warning. Imagine being 21-year-old Ben Carpenter on the world's wildest and fastest wheelchair ride. As he crossed an intersection on a sunny summer afternoon in 2007, the light changed. A large truck, whose driver didn't see him, started moving into the intersection. As they bumped, Ben's wheelchair turned to face forward, and its handles got stuck in the truck's grille. Off they went, the driver unable to hear Ben's cries for help. As they sped down the highway about an hour from my home, passing motorists caught the bizarre sight of a truck pushing a wheelchair at 50 miles per hour and started calling 911. (The first caller: "You are not going to believe this. There is a semi truck pushing a guy in a wheelchair on Red Arrow highway!") Lucky for Ben, one passerby was an undercover police officer. Pulling a quick U-turn, he followed the truck to its destination a couple of miles from where the wild ride had started, and informed the disbelieving driver that he had a passenger hooked in his grille. "It was very scary," said Ben, who has muscular dystrophy. In this section, we explore stress—what it is and how it affects us.

AP Photo/Michigan State Police

Extreme stress Ben Carpenter experienced the wildest of rides after his wheelchair got stuck in a truck's grille.

Stress: Some Basic Concepts

43-1 What events provoke stress responses, and how do we respond and adapt to stress?

Stress is a slippery concept. We sometimes use the word informally to describe threats or challenges ("Ben was under a lot of stress"), and at other times our responses ("Ben experienced acute stress"). To a psychologist, the dangerous truck ride was a *stressor.* Ben's physical and emotional responses were a *stress reaction.* And the process by which he related to the threat was *stress.* Thus, **stress** is the process of appraising and responding to a threatening or challenging event (**FIGURE 43.1**). Stress arises less from events themselves than from how we appraise them (Lazarus, 1998). One person, alone in a house, ignores its creaking sounds and experiences no stress; someone else suspects an intruder and becomes alarmed. One person regards a new job as a welcome challenge; someone else appraises it as risking failure.

stress the process by which we perceive and respond to certain events, called *stressors,* that we appraise as threatening or challenging.

When short-lived, or when perceived as challenges, stressors can have positive effects. A momentary stress can mobilize the immune system for fending off infections and healing wounds (Segerstrom, 2007). Stress also arouses and motivates us to conquer problems. In a Gallup World Poll, those who were stressed but not depressed reported being energized and satisfied with their lives—the opposite of the lethargy of those depressed but not stressed (Ng et al., 2009). Championship athletes, successful entertainers, and great teachers and leaders all thrive and excel when aroused by a challenge (Blascovich et al., 2004). Having conquered cancer or rebounded from a lost job, some people emerge with stronger self-esteem and a deepened spirituality and sense of purpose. Indeed, some stress early in life is conducive to later emotional resilience (Landauer & Whiting, 1979). Adversity can beget growth.

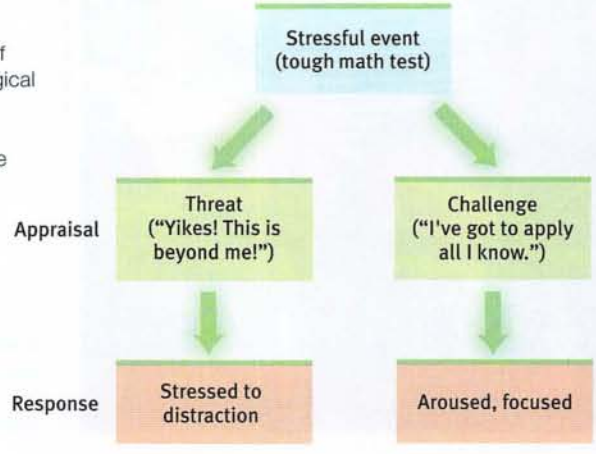
Extreme or prolonged stress can harm us. Children who suffer severe or prolonged abuse are later at risk of chronic disease (Repetti et al., 2002). Troops who had posttraumatic stress reactions to heavy combat in the Vietnam war later suffered greatly elevated rates of circulatory, digestive, respiratory, and infectious diseases (Boscarino, 1997). People who lose their jobs, especially later in their working life, are at increased risk of heart problems and death (Gallo et al., 2006; Sullivan & von Wachter, 2009).

So there is an interplay between our heads and our health. Before exploring that interplay, let's look more closely at stressors and stress reactions.

Stressors—Things That Push Our Buttons

Stressors fall into three main types: catastrophes, significant life changes, and daily hassles. All can be toxic.

Figure 43.1
Stress appraisal The events of our lives flow through a psychological filter. How we appraise an event influences how much stress we experience and how effectively we respond.




Roy Mehta/Getty Images

CATASTROPHES

Catastrophes are unpredictable large-scale events, such as wars, earthquakes, floods, wildfires, and famines. Nearly everyone appraises catastrophes as threatening. We often give aid and comfort to one another after such events, but damage to emotional and physical health can be significant. In surveys taken in the three weeks after the 9/11 terrorist attacks, for example, two-thirds of Americans said they were having some trouble concentrating and sleeping (Wahlberg, 2001). In the New York area, people were especially likely to report such symptoms, and sleeping pill prescriptions rose by a reported 28 percent (HMHL, 2002a; NSF, 2001). In the four months after Hurricane Katrina, New Orleans' suicide rate reportedly tripled (Saulny, 2006).


AFP/Getty Images

Toxic stress Unpredictable large-scale events, such as the severe earthquake that devastated Haiti in 2010, trigger significant levels of stress-related ills. When an earthquake struck Los Angeles in 1994, sudden-death heart attacks increased fivefold. Most occurred in the first two hours after the quake and near its center and were unrelated to physical exertion (Muller & Verrier, 1996).

For those who respond to catastrophes by relocating to another country, the stress is twofold. The trauma of uprooting and family separation combine with the challenges of adjusting to the new culture's language, ethnicity, climate, and social norms (Pipher, 2002; Williams & Berry, 1991). In the first half-year, before their morale begins to rebound, newcomers often experience culture shock and deteriorating well-being (Markovizky & Samid, 2008). Such relocations may become increasingly common because of climate change in years to come.

SIGNIFICANT LIFE CHANGES

Life transitions are often keenly felt. Even happy events, such as getting married, can be stressful. Other changes—graduating from high school, leaving home for college, losing a job, having a loved one die—often happen during young adulthood. The stress of those years was clear in a survey in which 15,000 Canadian adults were asked whether "You are trying to take on too many things at once." Responses indicated highest stress levels among young adults (Statistics Canada, 1999). Young adult stress appeared again when 650,000 Americans were asked if they had experienced a lot of stress "yesterday" (**FIGURE 43.2**).

Some psychologists study the health effects of life changes by following people over time. Others compare the life changes recalled by those who have or have not suffered a specific health problem, such as a heart attack. These studies indicate that people recently widowed, fired, or divorced are more vulnerable to disease (Dohrenwend et al., 1982; Strully, 2009). In one Finnish study of 96,000 widowed people, their risk of death doubled in the week following their partner's death (Kaprio et al., 1987). Experiencing a cluster of crises—losing a job, home, and partner, for example—puts one even more at risk.

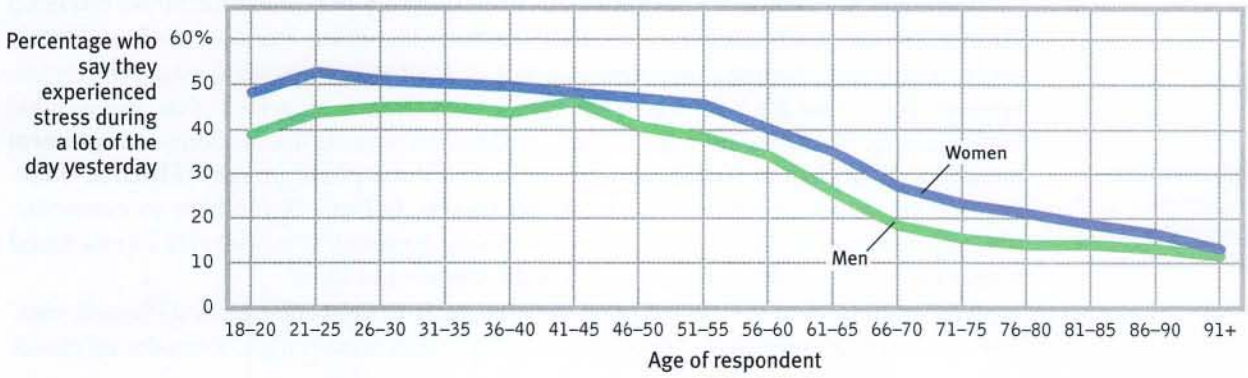


Figure 43.2
Age and stress
A Gallup-Healthways survey of more than 650,000 Americans during 2008 and 2009 found daily stress highest among younger adults (Newport & Pelham, 2009).

DAILY HASSLES

Events don't have to remake our lives to cause stress. Stress also comes from *daily hassles*—rush-hour traffic, aggravating siblings, long lunch lines, too many things to do, family frustrations, and friends who don't respond to calls or texts (Kohn & Macdonald, 1992; Repetti et al., 2009; Ruffin, 1993). Some people can simply shrug off such hassles. For others, however, the everyday annoyances add up and take a toll on health and well-being.

Many people face more significant daily hassles. As the Great Recession of 2008–2009 bottomed out, Americans' most oft-cited stressors related to money (76 percent), work (70 percent), and the economy (65 percent) (APA, 2010). Such stressors are well-known to residents of impoverished areas, where many people routinely face inadequate income, unemployment, solo parenting, and overcrowding.

Prolonged stress takes a toll on our cardiovascular system. Daily pressures may be compounded by anti-gay prejudice or racism, which—like other stressors—can have both psychological and physical consequences (Pascoe & Richman, 2009; Rostosky et al., 2010; Swim et al., 2009). Thinking that some of the people you encounter each day will dislike you, distrust you, or doubt your abilities makes daily life stressful. Such stress takes a toll on the health of many African-Americans, driving up blood pressure levels (Ong et al., 2009; Mays et al., 2007).

The Stress Response System

Medical interest in stress dates back to Hippocrates (460–377 B.C.E.). In the 1920s, Walter Cannon (1929) confirmed that the stress response is part of a unified mind-body system. He observed that extreme cold, lack of oxygen, and emotion-arousing events all trigger an outpouring of the stress hormones epinephrine and norepinephrine from the core of the adrenal glands. When alerted by any of a number of brain pathways, the sympathetic nervous system (see Figure 41.4) increases heart rate and respiration, diverts blood from digestion to the skeletal muscles, dulls feelings of pain, and releases sugar and fat from the body's stores. All this prepares the body for the wonderfully adaptive response that Cannon called *fight or flight.*

"You've got to know when to hold 'em; know when to fold 'em. Know when to walk away, and know when to run." -Kenny Rogers, "The Gambler," 1978

Since Cannon's time, physiologists have identified an additional stress response system. On orders from the cerebral cortex (via the hypothalamus and pituitary gland), the outer part of the adrenal glands secretes *glucocorticoid* stress hormones such as *cortisol.* The two systems work at different speeds, explains biologist Robert Sapolsky (2003): "In a fight-or-flight scenario, epinephrine is the one handing out guns; glucocorticoids are the ones drawing up blueprints for new aircraft carriers needed for the war effort." The epinephrine guns were firing at high speed during an experiment inadvertently conducted on a British Airways San Francisco to London flight. Three hours after takeoff, a mistakenly played message told passengers the plane was about to crash into the sea. Although the flight crew immediately recognized the error and tried to calm the terrified passengers, several required medical assistance (Associated Press, 1999).

Canadian scientist Hans Selye's (1936, 1976) 40 years of research on stress extended Cannon's findings. His studies of animals' reactions to various stressors, such as electric shock and surgery, helped make stress a major concept in both psychology and medicine. Selye proposed that the body's adaptive response to stress is so general that, like a single burglar alarm, it sounds, no matter what intrudes. He named this response the **general adaptation syndrome (GAS),** and he saw it as a three-phase process (**FIGURE 43.3**). Let's say you suffer a physical or an emotional trauma. In Phase 1, you have an *alarm reaction,* as your sympathetic nervous system is suddenly activated. Your heart rate zooms. Blood is diverted to your skeletal muscles. You feel the faintness of shock.

general adaptation syndrome (GAS) Selye's concept of the body's adaptive response to stress in three phases—alarm, resistance, exhaustion.

With your resources mobilized, you are now ready to fight back. During Phase 2, *resistance,* your temperature, blood pressure, and respiration remain high. Your adrenal glands

AP Photo/Luis Hidalgo

AP Photo/Chile's Presidency

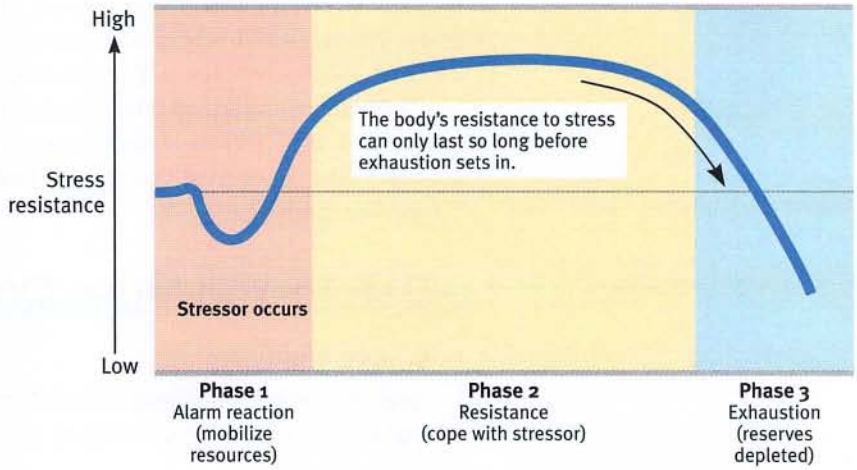


Figure 43.3

Selye's general adaptation syndrome When a gold and copper mine in Chile collapsed in 2010, family and friends rushed to the scene, fearing the worst. Many of those holding vigil outside the mine were nearly exhausted with the stress of waiting and worrying when, after 18 days, they received news that all 33 of the miners inside were alive and well.

pump hormones into your bloodstream. You are fully engaged, summoning all your resources to meet the challenge.

As time passes, with no relief from stress, your body's reserves begin to run out. You have reached Phase 3, *exhaustion.* With exhaustion, you become more vulnerable to illness or even, in extreme cases, collapse and death.

Selye's basic point: Although the human body copes well with temporary stress, prolonged stress can damage it. The brain's production of new neurons slows and some neural circuits degenerate (Dias-Ferreira et al., 2009; Mirescu & Gould, 2006). One study found shortening of *telomeres,* pieces of DNA at the ends of chromosomes, in women who suffered enduring stress as caregivers for children with serious disorders (Epel et al., 2004). Telomere shortening is a normal part of the aging process; when telomeres get too short, the cell can no longer divide and it ultimately dies. The most stressed women had cells that looked a decade older than their chronological age, which may help explain why severe stress seems to age people. Even fearful, easily stressed rats have been found to die sooner (after about 600 days) than their more confident siblings, which average 700-day life spans (Cavigelli & McClintock, 2003).

"You may be suffering from what's known as full-nest syndrome."

Fortunately, there are other options for dealing with stress. One is a common response to a loved one's death: Withdraw. Pull back. Conserve energy. Faced with an extreme disaster, such as a ship sinking, some people become paralyzed by fear. Another stress response, found especially among women, is to seek and give support (Taylor et al., 2000, 2006). This **tend-and-befriend** response is demonstrated in the outpouring of help after natural disasters.

tend-and-befriend response under stress, people (especially women) often provide support to others (tend) and bond with and seek support from others (befriend).

Facing stress, men more often than women tend to socially withdraw, turn to alcohol, or become aggressive. Women more often respond to stress by nurturing and banding together. This may in part be due to *oxytocin,* a stress-moderating hormone associated with pair bonding in animals and released by cuddling, massage, and breast feeding in humans

(Campbell, 2010; Taylor, 2006). Gender differences in stress responses are reflected in brain scans: Women's brains become more active in areas important for face processing and empathy; men's become less active (Mather et al., 2010).

It often pays to spend our resources in fighting or fleeing an external threat. But we do so at a cost. When stress is momentary, the cost is small. When stress persists, we may pay a much higher price, with lowered resistance to infections and other threats to mental and physical well-being.

Before You Move On

▶ ASK YOURSELF

How often is your stress response system activated? What are some of the things that have triggered a fight-or-flight response for you?

▶ TEST YOURSELF

What two processes happen simultaneously when our stress response system is activated? What happens if the stress is continuous?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 43 Review

43-1 What events provoke stress responses, and how do we respond and adapt to stress?

- *Stress* is the process by which we appraise and respond to stressors (catastrophic events, significant life changes, and daily hassles) that challenge or threaten us.
- Walter Cannon viewed the stress response as a "fight-or-flight" system.
- Later researchers identified an additional stress-response system in which the adrenal glands secrete glucocorticoid stress hormones.
- Hans Selye proposed a general three-phrase (alarm-resistance-exhaustion) *general adaptation syndrome (GAS).*
- Prolonged stress can damage neurons, hastening cell death.
- Facing stress, women may have a *tend-and-befriend* response; men may withdraw socially, turn to alcohol, or become aggressive.

Multiple-Choice Questions

1. Which of the following is an example of stress?

a. Ray is tense and anxious as he has to decide which college to attend.
b. Sunga is assigned an extra shift at work.
c. Joe's parents are allowing him to stay home alone while they go away for a weekend.
d. Linda remembers to repay a friend the $10 she owes her.
e. Enrico learns of a traffic accident on the Interstate.

2. The general adaptation syndrome (GAS) begins with

a. resistance.
b. appraisal.
c. exhaustion.
d. alarm.
e. challenge.

3. Which of the following is likely to result from the release of oxytocin?

a. A fight-or-flight response
b. A tend-and-befriend response
c. Social isolation
d. Elevated hunger
e. Exhaustion

Practice FRQs

1. Xavier has a huge math test coming up next Tuesday. Explain two ways appraisal can determine how stress will influence his test performance.

Answer

1 point: If Xavier interprets the test as a challenge he will be aroused and focused in a way that could improve his test performance.

1 point: If Xavier interprets the test as a threat he will be distracted by stress in a way that is likely to harm his test performance.

2. Name and briefly describe the three phases of Hans Selye's general adaptation syndrome (GAS).

(3 points)

Module 44

Stress and Illness


Aaron Haupt/Getty Images

Module Learning Objectives

44-1 Describe how stress makes us more vulnerable to disease.

44-2 Explain why some of us are more prone than others to coronary heart disease.

44-1 How does stress make us more vulnerable to disease?

Not so long ago, the term *psychosomatic* described psychologically caused physical symptoms. In common usage, the term came to mean that the symptoms were unreal—"merely" psychosomatic. To avoid such connotations and to better describe the genuine physiological effects of psychological states, most experts today refer instead to stress-related **psychophysiological illnesses,** such as hypertension and some headaches. Stress also leaves us less able to fight off disease. The field of **psychoneuroimmunology** studies these mind-body interactions (Kiecolt-Glaser, 2009). This awkward name makes sense when said slowly: Your thoughts and feelings *(psycho)* influence your brain *(neuro),* which influences the endocrine hormones that affect your disease-fighting *immune* system. And this field is the study of *(ology)* those interactions.

psychophysiological illness literally, "mind-body" illness; any stress-related physical illness, such as hypertension and some headaches.

psychoneuroimmunology the study of how psychological, neural, and endocrine processes together affect the immune system and resulting health.

lymphocytes the two types of white blood cells that are part of the body's immune system: *B lymphocytes* form in the *b*one marrow and release antibodies that fight bacterial infections; *T lymphocytes* form in the *t*hymus and other lymphatic tissue and attack cancer cells, viruses, and foreign substances.

Hundreds of experiments reveal the nervous and endocrine systems' influence on the immune system (Sternberg, 2009). You can think of the immune system as a complex surveillance system. When it functions properly, it keeps you healthy by isolating and destroying bacteria, viruses, and other invaders. Four types of cells are active in these search-and-destroy missions (**FIGURE 44.1**). Two are types of white blood cells, called **lymphocytes.** *B lymphocytes* mature in the *b*one marrow and release antibodies that fight bacterial infections. *T lymphocytes* form in the *t*hymus and other lymphatic tissue and attack cancer cells, viruses, and foreign substances—even "good" ones, such as transplanted organs. The third agent is the *macrophage* ("big eater"), which identifies, pursues, and ingests harmful invaders and worn-out cells. And, finally, the *natural killer cells* (NK cells) pursue diseased cells (such as those infected by viruses or cancer). Your age, nutrition, genetics, body temperature, and stress all influence your immune system's activity.

When your immune system doesn't function properly, it can err in two directions. Responding too strongly, it may attack the body's own tissues, causing some forms of arthritis or an allergic reaction. Underreacting, it may allow a dormant herpes virus to erupt or cancer cells to multiply. Women are immunologically stronger than men, making them less susceptible to infections, but this very strength also makes them more susceptible to self-attacking diseases, such as lupus and multiple sclerosis (Morell, 1995; Pido-Lopez et al., 2001).

Your immune system is not a headless horseman. The brain regulates the secretion of stress hormones, which suppresses the disease-fighting lymphocytes. Immune suppression appears when animals are stressed by physical restraints, unavoidable electric shocks, noise, crowding, cold water, social defeat, or separation from their mothers (Maier et al., 1994). One six-month study monitored immune responses in 43 monkeys (Cohen et al., 1992).

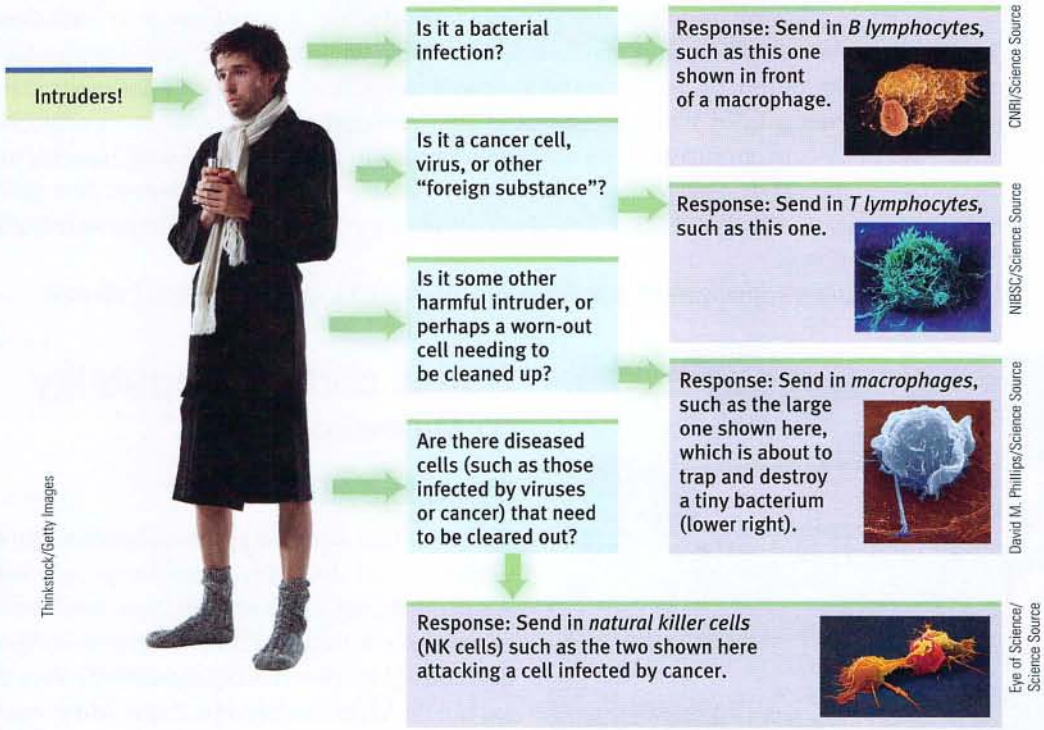


Figure 44.1
A simplified view of immune responses

Twenty-one were stressed by being housed with new roommates—three or four new monkeys—each month. By the end of the experiment, the socially disrupted monkeys' immune systems were weaker than those of monkeys left in stable groups. Human immune systems react similarly. Two examples:

- *Surgical wounds heal more slowly in stressed people.* In one experiment, dental students received punch wounds (precise small holes punched in the skin). Compared with wounds placed during summer vacation, those placed three days before a major exam healed 40 percent more slowly (Kiecolt-Glaser et al., 1998). Marriage conflict also slows punch-wound healing (Kiecolt-Glaser et al., 2005).
- *Stressed people are more vulnerable to colds.* Researchers dropped a cold virus into the noses of stressed and relatively unstressed people (**FIGURE 44.2**). Among those living stress-filled lives, 47 percent developed colds. Among those living relatively free of stress, only 27 percent did. In follow-up research, the happiest and most relaxed people were likewise markedly less vulnerable to an experimentally delivered cold virus (Cohen et al., 2003, 2006). Other studies reveal that major life stress increases the risk of a respiratory infection (Pedersen et al., 2010).

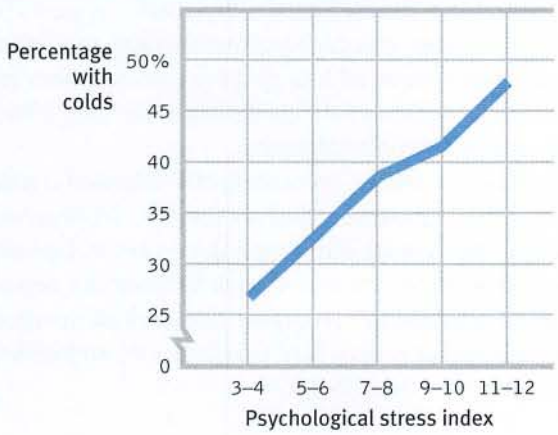


Figure 44.2
Stress and colds In an experiment by Sheldon Cohen and colleagues (1991), people with the highest life stress scores were also most vulnerable when exposed to an experimentally delivered cold virus.

The stress effect on immunity makes physiological sense. It takes energy to track down invaders, produce swelling, and maintain fevers. Thus, when diseased, your body reduces muscular energy output by inactivity and increased sleep. Stress does the opposite. It creates a competing energy need. During an aroused fight-or-flight reaction, your stress responses divert energy from your disease-fighting immune system and send it to your muscles and brain (see Figure 41.4). This renders you more vulnerable to illness. *The bottom line:* Stress does not make us sick, but it does alter our immune functioning, which leaves us less able to resist infection.

Let's consider some ways that stress might affect AIDS, cancer, and heart disease.

Photofusion/ UIG via Getty Images

Africa is ground zero for AIDS In Ghana, the Ministry of Health uses these informative billboards as part of prevention efforts.

Stress and Susceptibility to Disease

Stress and AIDS

We know that stress suppresses immune functioning. What does this mean for people with AIDS *(acquired immune deficiency syndrome)*? As its name tells us, AIDS is an immune disorder, caused by the *human immunodeficiency virus (HIV)*. AIDS has become the world's fourth leading cause of death and Africa's number one killer.

Ironically, if a disease is spread by human contact (as AIDS is, through the exchange of bodily fluids, primarily semen and blood), and if it kills slowly (as AIDS does), it can be lethal to more people. Those who acquire HIV often spread it in the highly contagious first few weeks before they know they are infected. Worldwide, some 2.6 million people—slightly more than half of them women—became infected with HIV in 2009, often without their awareness (UNAIDS, 2010). Years after the initial infection, when AIDS appears, people have difficulty fighting off other diseases, such as pneumonia. More than 25 million people worldwide have died of AIDS (UNAIDS, 2010). (In the United States, where "only" a half-million of these fatalities have occurred, AIDS has killed more people than did combat in all the twentieth-century wars.)

FYI

In North America and Western Europe, 74 percent of people with AIDS are men. In Sub-Saharan Africa, 60 percent of people with AIDS are women (UNAIDS, 2010).

Stress cannot give people AIDS. But could stress and negative emotions speed the transition from HIV infection to AIDS in someone already infected? Might stress predict a faster decline in those with AIDS? The answer to both questions seems to be *Yes* (Bower et al., 1998; Kiecolt-Glaser & Glaser, 1995; Leserman et al., 1999). HIV-infected men who experience stressful events, such as the loss of a partner, exhibit somewhat greater immune suppression and travel a faster course in this disease.

Would efforts to reduce stress help control the disease? Again, the answer appears to be *Yes*. Educational initiatives, bereavement support groups, cognitive therapy, relaxation training, and exercise programs that reduce stress have all had positive consequences for HIV-positive people (Baum & Posluszny, 1999; McCain et al., 2008; Schneiderman, 1999). But the benefits are small, compared with available drug treatments.

Although AIDS is now more treatable than ever before, preventing HIV infection is a far better option. This is the focus of many educational programs, such as the ABC (*a*bstinence, *b*eing faithful, *c*ondom use) program that has been used with seeming success in Uganda (Altman, 2004; USAID, 2004). In addition to such programs that seek to influence sexual norms and behaviors, today's "combination prevention" programs also include medical strategies (such as drugs and male circumcision that reduce HIV transmission) and efforts to reduce social inequalities that increase HIV risk (UNAIDS, 2010).

Stress and Cancer

Stress does not create cancer cells. But in a healthy, functioning immune system, lymphocytes, macrophages, and NK cells search out and destroy cancer cells and cancer-damaged cells. If stress weakens the immune system, might this weaken a person's ability to fight off cancer? To explore a possible connection between stress and cancer, experimenters have implanted tumor cells in rodents or given them *carcinogens* (cancer-producing substances). They then exposed some rodents to uncontrollable stress, such as inescapable shocks, which weakened their immune systems. Those rodents were indeed more prone to developing cancer (Sklar & Anisman, 1981). Their tumors developed sooner and grew larger than in nonstressed rodents.

Does this stress-cancer link also hold with humans? The results are mixed. Some studies find that people are at increased risk for cancer within a year after experiencing depression, helplessness, or bereavement (Chida et al., 2008; Steptoe et al., 2010). In one large Swedish study, the risk of colon cancer was 5.5 times greater among people with a history of workplace stress than among those who reported no such problems. This difference was not attributable to group differences in age, smoking, drinking, or physical characteristics (Courtney et al., 1993). Other studies, however, have found no link between stress and human cancer (Coyne et al., 2010; Petticrew et al., 1999, 2002). Concentration camp survivors and former prisoners of war, for example, do not have elevated cancer rates.

"I didn't give myself cancer."
-Mayor Barbara Boggs Sigmund (1939–1990), Princeton, New Jersey

One danger in hyping reports on emotions and cancer is that some patients may then blame themselves for their illness: "If only I had been more expressive, relaxed, and hopeful." A corollary danger is a "wellness macho" among the healthy, who take credit for their "healthy character" and lay a guilt trip on the ill: "She has cancer? That's what you get for holding your feelings in and being so nice." Dying thus becomes the ultimate failure.

It's important enough to repeat: *Stress does not create cancer cells.* At worst, it may affect their growth by weakening the body's natural defenses against multiplying malignant cells (Antoni & Lutgendorf, 2007). Although a relaxed, hopeful state may enhance these defenses, we should be aware of the thin line that divides science from wishful thinking. The powerful biological processes at work in advanced cancer or AIDS are not likely to be completely derailed by avoiding stress or maintaining a relaxed but determined spirit (Anderson, 2002; Kessler et al., 1991). And that explains why research consistently indicates that psychotherapy does not extend cancer patients' survival (Coyne et al., 2007, 2009; Coyne & Tennen, 2010).

FYI

When organic causes of illness are unknown, it is tempting to invent psychological explanations. Before the germ that causes tuberculosis (TB) was discovered, personality explanations of TB were popular (Sontag, 1978).

Stress and Heart Disease

44-2 Why are some of us more prone than others to coronary heart disease?

Stress is much more closely linked to **coronary heart disease,** North America's leading cause of death. In this disease, the blood vessels that nourish the heart muscle gradually close. Hypertension and a family history of the disease increase the risk of coronary heart disease. So do many behavioral factors (smoking, obesity, a high-fat diet, physical inactivity), physiological factors (an elevated cholesterol level), and psychological factors (stress responses and personality traits).

coronary heart disease
the clogging of the vessels that nourish the heart muscle; the leading cause of death in many developed countries.

In some classic studies, Meyer Friedman, Ray Rosenman, and their colleagues tested the idea that stress increases vulnerability to heart disease by measuring the blood cholesterol level and clotting speed of 40 U.S. male tax accountants at different times of year (Friedman & Rosenman, 1974; Friedman & Ulmer, 1984). From January through March, the test results were completely normal. Then, as the accountants began scrambling to finish their clients' tax returns before the April 15 filing deadline, their cholesterol and clotting measures rose to dangerous levels. In May and June, with the deadline past, the measures returned to normal. Stress predicted heart attack risk for these men. The researchers' hunch had paid off, launching a classic nine-year study of more than 3000 healthy men, aged 35 to 59.

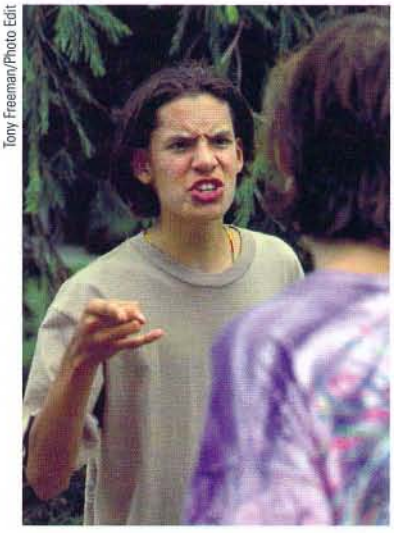
FYI

In both India and America, Type A bus drivers are literally hard-driving: They brake, pass, and honk their horns more often than their more easygoing Type B colleagues (Evans et al., 1987).

At the start of the study, the researchers interviewed each man for 15 minutes, noting his work and eating habits, manner of talking, and other behavioral patterns. Those who seemed the most reactive, competitive, hard-driving, impatient, time-conscious, supermotivated, verbally aggressive, and easily angered they called **Type A.** The roughly equal number who were more easygoing they called **Type B.** Which group do you suppose turned out to be the most coronary-prone?

Nine years later, 257 men had suffered heart attacks, and 69 percent of them were Type A. Moreover, not one of the "pure" Type Bs—the most mellow and laid back of their group—had suffered a heart attack.

As often happens in science, this exciting discovery provoked enormous public interest. But after that initial honeymoon period, researchers wanted to know more. Was the finding reliable? If so, what is the toxic component of the Type A profile: Time-consciousness? Competitiveness? Anger?



Tony Freeman/Photo Edit

More than 700 studies have now explored possible psychological correlates or predictors of cardiovascular health (Chida & Hamer, 2008; Chida & Steptoe, 2009). These reveal that Type A's toxic core is negative emotions—especially the anger associated with an aggressively reactive temperament. As we will see in Module 83's discussion of anger, when we are harassed or challenged, our active sympathetic nervous system redistributes bloodflow to our muscles, pulling it away from our internal organs. One of those organs, the liver, which normally removes cholesterol and fat from the blood, can't do its job. Type A individuals are more often "combat ready." Thus, excess cholesterol and fat may continue to circulate in their blood and later get deposited around the heart. Further stress—sometimes conflicts brought on by their own abrasiveness—may trigger altered heart rhythms. In people with weakened hearts, this altered pattern can cause sudden death (Kamarck & Jennings, 1991). Hostility also correlates with other risk factors, such as smoking, drinking, and obesity (Bunde & Suls, 2006). In important ways, people's minds and hearts interact.

"The fire you kindle for your enemy often burns you more than him." -Chinese proverb

Hundreds of other studies of young and middle-aged men and women have confirmed the finding that people who react with anger over little things are the most coronary-prone. Suppressing negative emotions only heightens the risk (Kupper & Denollet, 2007). One study followed 13,000 middle-aged people for 5 years. Among those with normal blood pressure, people who had scored high on anger were three times more likely to have had heart attacks, even after researchers controlled for smoking and weight (Williams et al., 2000). Another study followed 1055 male medical students over an average of 36 years. Those who had reported being hot tempered were five times more likely to have had a heart attack by age 55 (Chang et al., 2002). As others have noted, rage "seems to lash back and strike us in the heart muscle" (Spielberger & London, 1982).

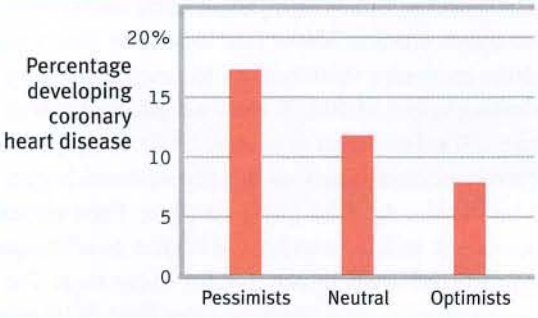
Type A Friedman and Rosenman's term for competitive, hard-driving, impatient, verbally aggressive, and anger-prone people.

Type B Friedman and Rosenman's term for easygoing, relaxed people.

Pessimism seems to be similarly toxic. One study followed 1306 initially healthy men who a decade earlier had scored as optimists, pessimists, or neither. Even after other risk factors such as smoking had been ruled out, pessimists were more than twice as likely as optimists to develop heart disease (**FIGURE 44.3**) (Kubzansky et al., 2001).

Figure 44.3

Pessimism and heart disease A Harvard School of Public Health team found pessimistic men at doubled risk of developing heart disease over a 10-year period. (From Kubzansky et al., 2001.)



Depression, too, can be lethal. Happy people tend to be healthier and to outlive their unhappy peers (Diener & Chan, 2011; Siahpush et al., 2008). Even a big, happy smile predicts longevity, as Ernest Abel and Michael Kruger (2010) discovered when they examined the photographs of 150 Major League Baseball players who had appeared in the 1952 *Baseball Register* and had died by 2009. On average, the nonsmilers had died at 73, compared with an average 80 years for those with a broad, genuine smile.


Photo File/Getty Images

"A cheerful heart is a good medicine, but a downcast spirit dries up the bones." -PROVERBS 17:22

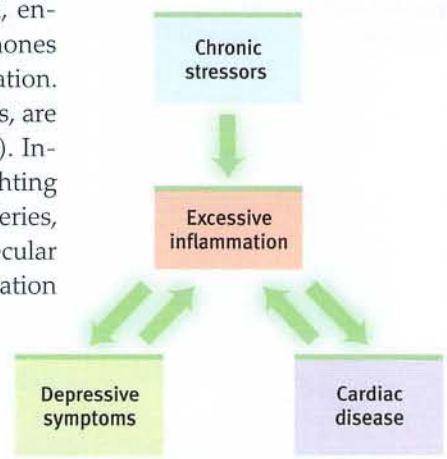
The accumulated evidence from 57 studies suggests that "depression substantially increases the risk of death, especially death by unnatural causes and cardiovascular disease" (Wulsin et al., 1999). After following 63,469 women over a dozen years, researchers found more than a doubled rate of heart attack death among those who initially scored as depressed (Whang et al., 2009). In the years following a heart attack, people with high scores for depression are four times more likely than their low-scoring counterparts to develop further heart problems (Frasure-Smith & Lesperance, 2005). Depression is disheartening.

Depressed people tend to smoke more and exercise less (Whooley et al., 2008), but stress itself is also disheartening:

- When following 17,415 middle-aged American women, researchers found an 88 percent increased risk of heart attacks among those facing significant work stress (Slopen et al., 2010).
- In Denmark, a study of 12,116 female nurses found that those reporting "much too high" work pressures had a 40 percent increased risk of heart disease (Allesøe et al., 2010).
- In the United States, a 10-year study of middle-aged workers found that involuntary job loss more than doubled their risk of a heart attack (Gallo et al., 2006). A 14-year study of 1059 women found that those with five or more trauma-related stress symptoms had three times the normal risk of heart disease (Kubzansky et al., 2009).

Research suggests that heart disease and depression may both result when chronic stress triggers persistent inflammation (Matthews, 2005; Miller & Blackwell, 2006). After a heart attack, stress and anxiety increase the risk of death or of another attack (Roest et al., 2010). As we have seen, stress disrupts the body's disease-fighting immune system, enabling the body to focus its energies on fleeing or fighting the threat. Yet stress hormones enhance one immune response, the production of proteins that contribute to inflammation. Thus, people who experience social threats, including children raised in harsh families, are more prone to inflammation responses (Dickerson et al., 2009; Miller & Chen, 2010). Inflammation fights infections; if you cut yourself, inflammation recruits infection-fighting cells. But persistent inflammation can produce problems such as asthma or clogged arteries, and worsen depression (see **FIGURE 44.4**). Researchers are now uncovering the molecular mechanisms by which stress, in some people, activates genes that control inflammation (Cole et al., 2010).

Figure 44.4
Stress→inflammation→heart disease and depression
Gregory Miller and Ekin Blackwell (2006) report that chronic stress leads to persistent inflammation, which heightens the risk of both depression and clogged arteries.



* * *

We can view the stress effect on our disease resistance as a price we pay for the benefits of stress (**FIGURE 44.5** on the next page). Stress invigorates our lives by arousing and motivating us. An unstressed life would hardly be challenging or productive.

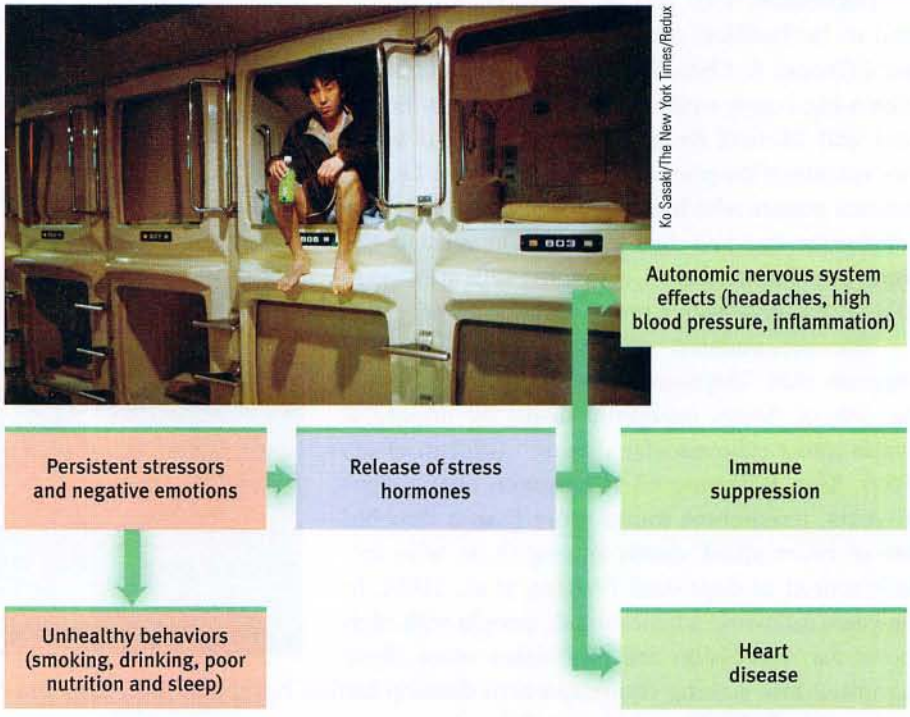


Figure 44.5

Stress can have a variety of health-related consequences This is especially so when stress is experienced by angry, depressed, or anxious people. Job and income loss caused by the recent economic recession has created stress for many people, such as this jobless Japanese man living in a Tokyo "capsule hotel."

Behavioral medicine research provides a reminder of one of contemporary psychology's overriding themes: *Mind and body interact; everything psychological is simultaneously physiological.* Psychological states are physiological events that influence other parts of our physiological system. Just pausing to *think* about biting into an orange section—the sweet, tangy juice from the pulpy fruit flooding across your tongue—can trigger salivation. As the Indian sage Santi Parva recognized more than 4000 years ago, "Mental disorders arise from physical causes, and likewise physical disorders arise from mental causes." There is an interplay between our heads and our health. We are biopsychosocial systems.

Before You Move On

▶ ASK YOURSELF

Are there changes you could make to avoid the persistent stressors in your life?

▶ TEST YOURSELF

Which component of the Type A personality has been linked most closely to coronary heart disease?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 44 Review

44-1 How does stress make us more vulnerable to disease?

- *Psychoneuroimmunologists* study mind-body interactions, including *psychophysiological* illnesses, such as hypertension and some headaches.
- Stress diverts energy from the immune system, inhibiting the activities of its *B* and *T lymphocytes,* macrophages, and NK cells.
- Stress does not cause diseases such as AIDS and cancer, but by altering our immune functioning it may make us more vulnerable to them and influence their progression.

44-2 Why are some of us more prone than others to coronary heart disease?

- *Coronary heart disease,* North America's number one cause of death, has been linked with the reactive, anger-prone *Type A* personality.
- Compared with relaxed, easygoing *Type B* personalities, Type A people secrete more of the hormones that accelerate the buildup of plaque on the heart's artery walls.
- Chronic stress also contributes to persistent inflammation, which heightens the risk of clogged arteries and depression.

Multiple-Choice Questions

1. Which of the following best identifies any stress-related physical illness, such as hypertension and some headaches?

a. Bacterial infection
b. Psychoneuroimmunology
c. Allergic reaction
d. Psychophysiological illness
e. Viral infection

2. What is North America's leading cause of death?

a. Psychosomatic disorders
b. Coronary heart disease
c. Cancer
d. Depression
e. Stroke

3. What did a famous Harvard University public health study identify as a factor that doubles the risk of heart disease?

a. Optimism
b. Apathy
c. Pessimism
d. Competitiveness
e. AIDS

Practice FRQs

1. Explain the two types of people identified by Friedman and Rosenman in their study on stress responses and personality traits.

Answer

1 point: Type A people are competitive, hard-driving, impatient, verbally aggressive, and anger prone.

1 point: Type B people are easygoing and relaxed.

2. Explain the difference between *B* lymphocytes and *T* lymphocytes.

(2 points)

Unit VIII Review

Key Terms and Concepts to Remember

motivation, p. 390
instinct, p. 391
drive-reduction theory, p. 391
homeostasis, p. 391
incentive, p. 392
Yerkes-Dodson law, p. 392
hierarchy of needs, p. 393
glucose, p. 397
set point, p. 398
basal metabolic rate, p. 398
sexual response cycle, p. 406
refractory period, p. 407
sexual dysfunction, p. 407
estrogens, p. 408
testosterone, p. 408
emotion, p. 421
James-Lange theory, p. 421
Cannon-Bard theory, p. 422
two-factor theory, p. 422
polygraph, p. 428
facial feedback effect, p. 438
health psychology, p. 439
stress, p. 442
general adaptation syndrome (GAS), p. 444
tend and befriend response, p. 445
psychophysiological illness, p. 448
psychoneuroimmunology, p. 448
lymphocytes, p. 448
coronary heart disease, p. 451
Type A, p. 452
Type B, p. 452

Key Contributors to Remember

Abraham Maslow, p. 393
William Masters, p. 406
Virginia Johnson, p. 406
William James, p. 421
Stanley Schachter, p. 422
Hans Selye, p. 444

AP® Exam Practice Questions

Multiple-Choice Questions

1. Which theory explains that physiological needs create an aroused state that motivates an organism to reduce the need?

a. Instinct theory
b. Drive-reduction theory
c. Achievement motivation
d. Arousal theory
e. Hierarchy of needs

2. Attempts to control social behavior by using the punishing effects of isolation is an example of

a. attachment disorder.
b. ostracism.
c. exploitation.
d. wanting to belong.
e. conforming.

3. Which theory explains why, even when our biological needs are satisfied, we may still feel driven to experience stimulation?

a. Incentive
b. Homeostasis
c. Instinct
d. Arousal theory
e. Physiology

4. Why does further weight loss come slowly following a rapid loss during the initial three weeks of a rigorous diet?

a. The number of fat cells makes further weight loss impossible.
b. When a person's hunger increases, metabolism increases.
c. When an obese person's set point has been reached, weight loss increases dramatically.
d. The body reacts as if it's being starved and metabolic rates drop.
e. An obese person cannot maintain a rigorous weight loss diet.

5. Research on semistarvation found that men who were given just enough food to stabilize their weight at 25 percent below their starting weight

a. became obsessed with physical exercise.
b. were more interpersonally outgoing.
c. showed increases in mental cognition.
d. were in a state of homeostasis.
e. lost interest in social activities.

6. Which of the following is the best biological explanation for why the human body stores fat?

a. Fat signals affluence and social status.
b. Fat is a fuel reserve during periods when food is scarce.
c. Fat is a display of abundant food sources.
d. Fat keeps the body warm in winter climates.
e. Fat combats the global epidemic of diabetes.

7. What do we call a need or desire that energizes and directs behavior?

a. Incentive
b. Refractory period
c. Emotion
d. Motivation
e. Instinct

8. Which of the following actions is a violation of Maslow's hierarchy of needs?

a. A person who moves to a new city gets an apartment before beginning to make friends.
b. A very hungry reality show contestant searches for food before trying to win a competition.
c. A professor spends time socially with her colleagues before she works on her own research.
d. An artist works to win a local award before spending time on his own personal projects.
e. An athlete follows a "no pain, no gain" motto rather than stopping for rest and nourishment.

9. What term refers to the ability of the body's physiological processes to maintain a balanced or constant internal state?

a. Hierarchy of needs
b. Basal metabolic rate
c. Homeostasis
d. Instinct
e. Motivation

10. A person who eats excessively and never seems to feel full may have which of the following conditions?

a. Tumor in the hypothalamus
b. Too much insulin
c. Stomach ulcer
d. Stomach bypass surgery
e. Too much of the hormone PYY

11. Which of the following is one of the stages of the sexual response cycle described by Masters and Johnson?

a. Expulsion
b. Plateau
c. Attraction
d. Compensation
e. Depolarization

12. Emotions are a mix of consciously experienced thoughts, expressive behaviors, and physiological arousal. Which theory emphasized the importance of consciously experienced thoughts?

a. Facial feedback theory
b. James-Lange theory
c. Arousal and performance theory
d. Fight-or-flight theory
e. Schachter-Singer two-factor theory

13. Surveys conducted with people who have high spinal cord injuries suggest to researchers that emotions are

a. entirely cognitive, requiring no physical response to be intense.
b. largely dependent upon our bodily responses and behaviors.
c. mostly a social response to surrounding factors.
d. mostly a cultural reaction to context.
e. mostly psychological.

14. The stress hormones epinephrine and norepinephrine are released from where?

a. Parasympathetic nervous system
b. Hippocampus
c. Brain stem
d. Adrenal glands
e. Hypothalamus

15. When hearing emotions conveyed in another language, what emotion can people most readily detect?

a. Sadness
b. Happiness
c. Anger
d. Fear
e. Surprise

16. Brain scans and EEG recordings indicate that positive emotions are associated with high levels of activity in which brain section?

a. Right temporal lobe
b. Cerebellum
c. Left frontal lobe
d. Left temporal lobe
e. Right parietal lobe

17. Which one of the following statements about stress is *true*?

a. Surgical wounds heal more slowly in stressed humans.
b. Stress has no effect on those exposed to cold viruses.
c. There is no correlation between stress and longevity.
d. Stress makes us more resistant to infection and heart disease.
e. Anxiety, irritation, and guilt all prompt very different physiological responses.

18. Which of the following statements about nonverbal expression is *true*?

a. People blind from birth do not usually exhibit common facial expressions.
b. The meaning of gestures is the same across cultures.
c. Facial signs of emotion are generally understood across world cultures.
d. People from different cultures have difficulty understanding nonverbal expressions.
e. Nonverbal expression is not reliably interpreted within a culture.

19. Which psychological concept would predict that smiling warmly on the outside would cause you to feel better on the inside?

a. Relative deprivation
b. Mimicry
c. Empathy
d. Facial feedback
e. Catharsis

20. After an alarming event, your temperature, blood pressure, and respiration are high, and you have an outpouring of hormones. Hans Selye would most likely guess that you are in which general adaptation syndrome phase?

a. Exhaustion
b. Resistance
c. Immobilization
d. Collapse
e. Shock

Free-Response Questions

1. Bill is applying for admission to the University of Michigan and has completed the entire process except for writing his application essay. He is very nervous about writing the essay because it is such an important part of the acceptance process and the topic he was assigned is very challenging.

Explain how each of the following psychological concepts might relate to how Bill feels five months later when he receives a letter of acceptance from the University of Michigan.

- Maslow's hierarchy
- James-Lange theory
- Cannon-Bard theory
- Schachter-Singer two-factor theory

Rubric for Free Response Question 1

1 point: According to Maslow's hierarchy, Bill's decision to apply to the University of Michigan is the result of a need or drive (motivation) to achieve the higher psychological needs of belonging, esteem, self-actualization, or self-transcendence. Bill is able to focus on these higher-level needs because his physiological and safety needs have already been met. Page 393

1 point: According to the James-Lange theory, when Bill receives the letter in the mail, his heart races and his breathing increases, which causes his brain to automatically interpret this experience as the emotion of excitement.

Note: Bill may exhibit any emotion as long as the physical arousal occurs prior to the experience of the emotion. Page 421

1 point: According to the Cannon-Bard theory, when Bill receives the letter in the mail, his heart races and his breathing increases at the same time that he experiences the emotion of excitement. He simultaneously experiences an increase in physiological arousal and the emotion of happiness. Page 422

1 point: According to the Schachter-Singer two-factor theory, when Bill opens his letter, he experiences an increase in physical arousal and determines that he is experiencing happiness based on his memories and thoughts.
Note: Bill may exhibit any emotion as long as the response includes a physical arousal and a cognitive labeling of that emotion. Page 422

2. Hope's soccer team is playing in the championship game today. Hope knows the opposing team is the defending champion and that this will be a challenging game. Explain how the following theories apply to Hope's performance and reactions during the game.

- Yerkes-Dodson law
- Affiliation needs
- Schachter-Singer theory of emotion

(3 points)

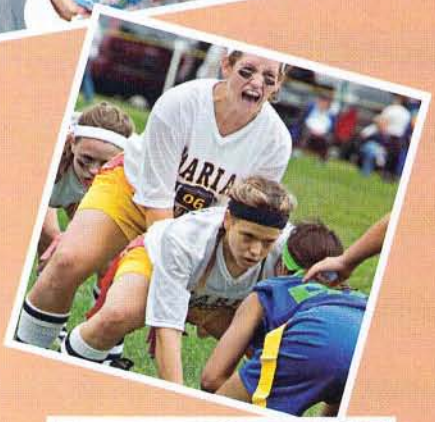
Multiple-choice self-tests and more may be found at www.worthpublishers.com/MyersAP2e

3. Franz is 17 and wants to lose 15 pounds. Explain how the following factors might contribute to the success or failure of his weight-loss attempt.

- Social influence
- Set point
- Sleep
- Incentive theory

(4 points)

Unit IX



Developmental Psychology

Modules

45 Developmental Issues, Prenatal Development, and the Newborn

46 Infancy and Childhood: Physical Development

47 Infancy and Childhood: Cognitive Development

48 Infancy and Childhood: Social Development

49 Gender Development

50 Parents, Peers, and Early Experiences

51 Adolescence: Physical and Cognitive Development

52 Adolescence: Social Development and Emerging Adulthood

53 Sexual Development

54 Adulthood: Physical, Cognitive, and Social Development

Life is a journey, from womb to tomb. So it is for me, and so it will be for you. My story, and yours, began when a man and a woman together contributed 20,000+ genes to an egg that became a unique person. Those genes coded the protein building blocks that, with astonishing precision, formed our bodies and predisposed our traits. My grandmother bequeathed to my mother a rare hearing loss pattern, which she, in turn, gave to me (the least of her gifts). My father was an amiable extravert, and sometimes I forget to stop talking. As a child, my talking was impeded by painful stuttering, for which Seattle Public Schools gave me speech therapy.

Along with my parents' nature, I also received their nurture. Like you, I was born into a particular family and culture, with its own way of viewing the world. My values have been shaped by a family culture filled with talking and laughter, by